

Canadian Airline Deregulation and Privatization:

**Assessing Effects
and Prospects**

by

David W. Gillen

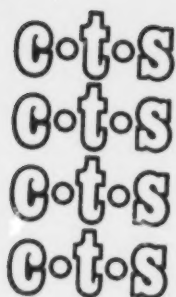
Tae H. Oum

Michael W. Tretheway

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**Centre for Transportation Studies
University of British Columbia**

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David W. Gillen

Wilfred Laurier University

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University of British Columbia

Michael W. Tretheway

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ASSESSING EFFECTS AND PROSPECTS

by

David W. Giller
Department of Economics
Wilfrid Laurier University
Waterloo, Ontario N2L 3C5
Phone: (519) 884-1970

Tae H. Oum
Faculty of Commerce and Business Administration
University of British Columbia
Vancouver, B.C. V6T 1Y8
Phone: (604) 228-2753

Michael W. Tretheway
Faculty of Commerce and Business Administration
University of British Columbia
Vancouver, B.C. V6T 1Y8
Phone: (604) 228-6426

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Centre for Transportation Studies
University of British Columbia
Vancouver, British Columbia, V6T 1W5
Canada
(phone: 604-228-4510)



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PREFACE

Readers interested in the main conclusions of this study should consult chapters 10, 11 and 12 of the main report. Those desiring an overview of the entire study should read the chapter by chapter executive summary. Chapter 2 describes the industry and historical policies for those not already familiar with it. The main body of the report is written, we hope, so that the intelligent lay reader can follow its discussion. Technical details are relegated to a series of appendices or to our forthcoming book titled Airline Costs and Performance: Implications for Public and Industry Policies, also available from University of British Columbia Center for Transportation Studies.

We gratefully acknowledge the financial support of the Treasury Board of Canada in pursuing this study. While this work constitutes significant "value added", it necessarily draws on a foundation of several strands of research which the three of us have been pursuing independently and jointly since 1977.

This eight year research program could not have been sustained without the financial support of several entities. We gratefully acknowledge support from the Transport Canada Transport University Program, the Research Branch of the Canadian Transport Commission, the Institute for Research on Public Policy, the Economic Council of Canada, Consumer and Corporate Affairs Canada, the National Science Foundation, the Wisconsin Economic Research Institute, Laurits R. Christensen Associates, Inc., the Centre for International Business Studies at the University of British Columbia, the UBC Faculty of Commerce and Business Administration, the UBC Centre for Transportation Studies, the School of Business and Economics at Wilfrid Laurier University, and the School of Business, Queen's University.

We gratefully acknowledge the proficient research skills of our colleague Lesley Boucher. Research assistance was provided by Robert Andrulaitis, Geoff Dickson, Dave Frank, John Spragge and Mike Weiss. We owe an enormous debt to the skilled, dedicated and patient word processors at WLU, Susan Kirkey, Maureen Nordin and most of all Elsie Grogan.

EXECUTIVE SUMMARY

This section contains a brief description of the highlights of each chapter in the text. It is intended to provide a concise overview of the study.



Chapter 1: Introduction

What would the Canadian air transport industry look like if the country a) continues to take steps toward deregulation or b) if it privatizes or dismembers the crown carrier, Air Canada? These are the fundamental questions considered by this study. We are not the only ones seeking to address these issues. Other researchers and industry analysts before and, no doubt, concurrently with us have sought the answers. Our study, however, is distinguished from the others in two important respects.

First, our study relies primarily on Canadian data, Canadian models and knowledge of Canadian institutions. Many other studies draw heavily on the U.S. experience with its brand of deregulation. While the U.S. experience can be enlightening, it cannot be imported to Canada wholesale - i.e. without significant value added. The air transport systems in the two countries are distinctly different. Canada, for example, has a government air carrier which has been used as an instrument of public policy for forty years. It has 60% of the domestic market. In the U.S., where all air carriers are privately owned, no single firm has even 20% of the domestic market. We recognise that the U.S. experience is valuable. Indeed, we will draw on it when similar Canadian evidence is missing, or as a secondary support to conclusions drawn from Canadian data. Nevertheless, we believe Canadian policy questions should and must be addressed, where possible, by interpreting Canadian data and Canadian models within the context of the institutional setting of the Canadian airline industry.

Research Objectives

- (1) Identify the set of prospective air transport policies that are of greatest interest to policy makers.
- (2) Utilize the models developed in our previous work and those evolving in our current work to simulate the impact of specified policy changes on airline performance as measured by changes in total factor productivity (an efficiency measure) and unit cost.
- (3) Provide a summary picture of the changes which might be expected in the Canadian airline industry for each policy.

Alternative Policies

In this research we provide an analysis of both the May 10th and pre-May 10th policies. In addition, we define and assess two sequential policies, one which moves the industry toward greater liberalization, and the other to complete deregulation. Any analysis of Canada's air transport policy cannot ignore Air Canada and its impact upon policy and the industry. In our policy analysis we integrate alternative scenarios for Air Canada. These include the May 10th status and two privatization schemes; one with and one without breaking up the carrier. These policies were identified after meeting with officials of government, the airlines and consumer groups.

Chapter 2: Description of the Industry

Any study of air transport regulatory reform and public policy should begin with an understanding of the industry and its institutions. In this chapter, the main report describes the structure of the Canadian airline industry and its major carriers. It also contains a sketch of the development of air transport policy in Canada.

The Canadian airline industry consists of four groups of carriers. The transcontinental carriers are Air Canada (with 56% of industry revenues) and CP Air (22%). The four regional carriers are: Pacific Western Airlines (8%), Nordair (3%), Eastern Provincial Airlines (2%) and Quebecair (2%). The charter carrier is Wardair with 7% of industry revenues. In addition, there are roughly 75 third level carriers. The largest Canadian airline, Air Canada, would rank 8th on a list of combined U.S. and Canadian airlines. CP Air would rank 14th. The Canadian airline industry has a high degree of government ownership. Air Canada, the Crown carrier has been 100% federally owned since its conception. It has always been an instrument of government policy towards air transport. The most recent legislation outlining Air Canada's role in air transport is the 1977 New Air Canada Act. PWA, Canada's third largest air carrier, was acquired by the province of Alberta in 1974. In December, 1983, Alberta sold the airline to the public retaining only 4% of the outstanding voting shares of stock. Nordair, the fourth largest air carrier was acquired by Air Canada in 1978. Nordair was sold to Innocan Inc. in 1984. Effective control of Quebecair was obtained by the Province of Quebec in July, 1981.

Canada's two largest carriers, Air Canada and CP Air operate structures consisting of transcontinental routes, regional routes, transborder routes to the U.S., and international routes. The four regional carriers were, until May 10th, 1984, confined to nonoverlapping regions. They had limited competition with the transcontinental carriers.

Air Canada was established by the 1937 Trans Canada Airlines Act. Federal regulation of Canadian air transport began with the passage of the Transport Act of 1938. The National Transportation Act of 1967 created the Canadian Transport Commission. The Air Transport Committee of the CTC is the current regulatory authority for air transport in Canada.

Regulatory policy towards commercial air transport has evolved through three phases. First, from 1936 to about 1960, regulators were exclusively concerned with developing a large network of reliable service. To this end, Air Canada was given a protected monopoly. Second, during the 1960s and early 1970s CP Air was allowed limited competition with Air Canada on the most heavily travelled routes. During this time, the Regional Carrier Policy, confining carriers to respective regions, became effective. Third, since the mid 1970s policy has tended to ease some of the restrictions imposed on the carriers. These included removing some restrictions on charter operations and allowing some discount fares. The new Air Canada Act of 1977 instructed that carrier to be market oriented and profit seeking.

On May 10th, 1984, Transport Minister Lloyd Axworthy, announced the New Canadian Air Policy. This "Liberalization" policy gives carriers complete freedom to lower air fares, and it injects elements of competition in many areas of Canadian air transport.

Chapter 3: Transport Policy: Options for Consideration

A. Introduction

In this chapter we identify and spell out the alternative policies considered in this research. These include policies both with respect to regulation and with respect to the Crown carrier, Air Canada. These policies were developed after consultation with members of government, industry, and consumer groups.

B. Regulatory Policy: Four Options for Consideration

Status Quo (Pre May 10th, 1984)

We define the status quo regulatory policy as that which existed prior to May 10th, 1984. This policy consisted of complete regulation of entry, exit and fares in the industry. Selected regulation of conditions on air routes was also used. Regional carriers were confined to services within geographical regions. Of paramount importance is the application of the public convenience and necessity (PCN) criterion for entry into and exit from city pair markets.

The May 10th, 1984 Policy

The important changes of this policy relative to the status quo include the granting of freedom to lower fares. In using the PCN criterion for entry into airline markets the benefits of competition are now to be given greater weight. Unlimited entry is allowed into round trip charter markets. Canada is divided into two regions, North and South. All aspects

of the status quo regulatory policy continue to apply in the North. Air Canada is restricted from engaging in competitive pricing and scheduling practices. The thrust of this policy is to provide for an increase of entry into major Canadian markets, as well as to provide freedom for price decreases. The structure of regulation still remains.

Advanced Liberalization*

This policy provides an intermediate stage between full deregulation and the current liberalization policy of May 10th, 1984. It is intended to reduce the protection of incumbent carriers from market forces without exposing them to the complete volatility of deregulation. This policy continues the existence of the PCN criterion for entry and exit. However, carriers will be allowed to enter one way charter markets, and third level air carriers will be exempted from all forms of route and pricing regulation. The North/South geographic distinction is eliminated. All carriers will be given freedom to raise fares in short haul markets. Finally, a small and isolated community subsidy program is to be instituted.

Complete Deregulation

Here carriers have unlimited freedom to enter and exit markets and unlimited freedom to raise and lower fares. To achieve this, legislation is

*We have chosen to use the term "liberalization" in spite of (not because of) its likeness to the name of a Canadian political party. "Liberalization" is the term that has been used in studies of U.S., Australian, European and international air transport.

required to remove the PCN criterion. The policy includes the small and isolated community subsidy program and introduces an airline employee dislocation and retraining program. The latter is intended to ease the adjustment of individual airline employees who might be adversely affected by deregulation. The subsidy and retraining program could be financed by an airline passenger ticket tax.

C. Alternative Policies With Respect to Air Canada

Pre-May 10th Air Canada Policy. Air Canada is 100% federally owned. The carrier has reasonable access to public funds without achieving a rigorous private sector investment test.

May 10th Air Canada Policy. Air Canada must achieve a private sector investment test for access to additional public funds. The carrier is constrained in its ability to act competitively in domestic markets.

Privatization Without Breakup. Under this policy Air Canada is sold to the private sector but there is no partition or subdivision of the carrier. There are four different methods for selling Air Canada: sale to the highest bidder, a general sale or placement of stock, give a share to all Canadians, or sell to employees. A general sale could be undesirable if the new owners are unable to wrest control of the airline from management. Giving a share in Air Canada to all Canadians would only enhance Air Canada's dominance as Canadians would choose to fly "their own" air carrier, ceteris paribus. Selling shares to employees could be attractive in winning the cooperation of labor for cost reductions. However, such sales typically occur at prices less than the market worth of the firm, or

with the pledging of substantial amounts of company assets to finance the purchase. The latter could saddle the carrier with high debt payments in the future and make it uncompetitive.

Privatization With Breakup. Under this policy we consider a dismemberment of the carrier into one or more pieces. Each of the pieces in turn is sold to the private sector. The motivation for such a breakup would be to reduce the dominance of any one carrier in Canadian domestic markets. There are a number of different ways by which Air Canada could be broken up. One method is to divide the carrier into a domestic airline and an international airline. This does little to reduce the carrier's dominance in domestic markets. Further, there is some evidence suggesting a synergy between domestic and international operations. Another proposed breakup is to separate the carrier's support services, such as reservations and maintenance, from its operations side. Again, this does little to reduce the dominance of the carrier in domestic markets.*

A third alternative is to sever Air Canada with one piece consisting of transcontinental routes and a second piece consisting of its regional routes. While this combination does afford some potential for reducing the absolute dominance of Air Canada in domestic markets, the resulting route structure could be very uneconomic. A fourth alternative is perhaps a more

*Separating Air Canada's reservation system might be considered to eliminate the potential for a private yet dominant Air Canada engaging in anti-competitive behavior through "abuse" of the services it provides to competitors. We know of no evidence at present that indicates there has been any significant abuse.

intelligent variation of the previous one. Here Air Canada would be broken up into perhaps two or three pieces. Each of the smaller carriers would have a set of regional routes. In addition each would receive the rights, necessary equipment and personnel to operate in transcontinental markets.

Chapter 4: The Data Base and Industry Trends

A. The Canadian Data Base

The measurement of total factor productivity and estimation of cost functions requires data on prices and quantities of outputs, attributes of each output, network variables, and prices and quantities of inputs. We created a data base of annual data for the years 1964 - 1981, for the following Canadian air carriers: Air Canada, CP Air, PWA, Nordair, Transair, Quebecair, and EPA. Data after 1981 or for Wardair were not available.

B Review of Industry Trends

This section of the report presents several figures describing trends in the industry. The following points can be made:

- 1) Most air carriers have had reductions or slowing in output growth since 1980. Quebecair and Nordair in particular have had noticeable traffic declines.
- 2) The regional carriers' traffic has a significantly higher proportion of charter services than either CP Air or Air Canada.
- 3) Air Canada paid the highest average wage rates from 1964 through 1982. They were closely followed by CP Air.
- 4) Almost all the carriers have paid similar prices for jet fuel.
- 5) The number of airports served by Air Canada has increased from 54 airports in 1965 to 64 in 1981. CP Air reduced its points from 45 in 1964 to 32 in the mid 1970s.

- 6) CP Air operates some very long haul routes. Air Canada's average route length is only somewhat less than that of CP. The regional carriers primarily operate routes with short stage lengths.
- 7) An examination of carrier profits indicates that PWA has achieved a consistent record of economic profits throughout the study period. All carriers except PWA and EPA suffered economic losses in 1981. Quebecair, EPA and Transair had significant periods with negative profits.

Chapter 5: Productivity and Cost Analysis

A. Introduction

In this chapter we investigate the economic performance of Canadian airlines using two related measures: total factor productivity (TFP) and unit cost. TFP is the amount of output produced by a carrier per unit of input. TFP recognizes the nature of airline production in which multiple outputs are produced using more than one input (or factors of production). Unit cost is a mirror image of TFP (cost or resources used per unit of output), but it allows a more thorough investigation of crucial issues such as economies of density, scale and scope as well as allowing simulation of the impacts of alternative regulatory and ownership policies on carrier and industry performance.

B. Total Factor Productivity

In this section we describe the results of our measurement of total factor productivity (TFP) for the Canadian airlines. We find CP Air has the highest level of TFP followed closely by Air Canada. The regionals have lower productivity levels.

C. Analysis of Differences in TFP

In this section we explain why TFP differs between firms and what accounts for its growth or decline over time. The basic approach involves regression analysis to attribute TFP growth to several factors. The findings indicate that there are significant economies of traffic density

in Canadian airlines and insignificant economies of firm size. Economies of traffic density occur when output grows within a network of fixed size. Economies of firm size are said to occur when costs decline if output growth is due to increasing the size of the network. The findings also indicate that there are important economies of stage length, and that the Canadian airline industry in general has too much capital.

We use these results to explain TFP differences between the Canadian airlines. The results indicate that after controlling for factors such as economies of traffic density and stage length, all of the Canadian airlines have roughly similar levels of productivity. Specifically, CP Air's high productivity is largely explained by its significantly longer stage lengths. The findings also indicate that Air Canada has significant excess capital. This is consistent with the observation that the carrier has excess aircraft.

D. Cost Function Analysis

Having completed measurement and analysis of Canadian airline productivity we now turn our attention to estimation of a cost function. Our methodology for specifying the cost function is consistent with widely held principles of neoclassical economics. The main findings of the cost function are as follows:

- 1) All airlines experienced constant returns to firm size. Unit costs would not fall if Canadian carriers expand traffic by adding more cities to their networks.

- 2) There is evidence of significant economies of traffic density for all airlines except, possibly, Air Canada. Unit costs would decline if carriers could expand traffic within their existing networks. Unit costs could also fall if a carrier dropped a low density point and added a high density point.
- 3) There is a cost complimentary between scheduled passenger services and charter services only if the proportion of charter services is less than roughly five percent. Expansion by a carrier of charter service beyond roughly ten percent increases the marginal cost of scheduled passenger service. This indicates that the Regional Carrier Policy, confining the smaller carriers to specific regions and encouraging them to operate charter services, has resulted in higher costs.
- 4) Stage length is an important factor affecting costs.

Our findings of constant returns to firm size indicate that Air Canada might not have a cost advantage over other Canadian carriers due to its large network size. Its high traffic density, however, may give it an important edge. The cost function findings also indicate that Air Canada has significant excess capital. The regionals also have excess capital but not to the same extent. CP Air seems to have the most efficient amount of capital.

Our findings lead us to the following conclusions. First, since productivity depends on several factors, interfirm comparisons of performance should be based on residual (unexplained) TFP or residual cost. That is, the analyst must control for operating factors before making comparisons.

Second, after controlling for such factors we found that Air Canada, and to a lesser extent the regionals, have had higher costs due to the use of excessive amounts of capital. Third, by examining the sources of TPP changes we speculate that efficiency improvements under a U.S. style deregulation would be smaller in Canada because scheduling competition has not caused low load factors in Canada, as it had in the U.S. Fourth, the Regional Carrier Policy has resulted in a higher level of cost for the regional carriers than could have been achieved.

Chapter 6: Demand for Air Travel

In this chapter we examine evidence on the demand for air travel in Canada. We only had limited data available to us, so our findings are general for all of Canada and cannot be applied to specific routes. Overall, we find a price elasticity for air travel in Canada such that a 1% decline in air fares will, on average, increase traffic by 1.1% to 1.3%. The income elasticity is 1.6% to 2.4% showing the responsiveness of Canadian air travel to economic conditions.

Using the detailed publicly available data in the U.S., we observe the price elasticity to be roughly .8% for first class services, 1.4% for full fare coach services and 1.6% for discount seats.

Chapter 7: U.S. and Other Experiences with Deregulation

A. Introduction

As Canada contemplates regulatory reform of air transport, it is natural to look to the experiences of others to gain information as to what changes might occur. In this chapter we examine the experiments in Chile and the United States in an attempt to shed some light on the impacts that might occur should Canada deregulate. In addition, we also look at the recent legislation passed in New Zealand. While it is too soon to observe the impacts of its 1983 and 1984 deregulation steps, we found that the structure that New Zealand chose for implementing regulatory reform to be quite interesting for Canada.

B. U.S. Deregulation

There are many accounts of the evolution of U.S. deregulation, the actual legislation passed, and the major impacts of it. We do not provide yet another accounting. Here we describe some of the technical and analytical aspects of the impact of deregulation in the U.S. that have not been addressed adequately elsewhere.

U.S. deregulation is characterized by the following aspects:

- 1) Elimination of all route, entry and exit regulation.
- 2) Elimination of all regulation of prices and conditions of service.
- 3) Replacement of the "public convenience and necessity" requirement for entry as a carrier into the industry with a "fit, willing and able" criteria.

4) A subsidy program to maintain services to small communities for a period of ten years.

5) A labor protection program that was totally ineffective.

We now summarize our observations regarding U.S. deregulation.

1) U.S. load factors have increased since deregulation.

2) Charter carriers have converted to scheduled service or have ceased operations.

3) Air freight has decreased in importance for the scheduled passenger carriers. Specialized air express carriers, such as Federal Express have emerged.

4) There appears to be some synergy between regional feeder, and transcontinental routes. Similarly, there may be synergy between transcontinental and international routes.

5) The feed from third level carriers has been important to the trunk and local service carriers. Nevertheless, no attempt has been made to merge a third level carrier into a larger carrier.

6. Since deregulation almost all carriers have adopted hub and spoke route networks.

7. The U.S. air industry has not increased in concentration since deregulation. (i.e., the largest firms have not increased their market shares.)

8) Annual productivity growth has increased from 2.8% to 5.1% per year since deregulation.

C. Regulatory Reform in Chile

Chile deregulated its entire domestic air transport system in 1979. The country chose to maintain its ownership of LAN Chile, the dominant government owned airline, and continued to provide it with substantial subsidies. As with the U.S., it has been difficult to sort out the effects of domestic deregulation of air transport from the effects of a simultaneous economic contraction. (Real gross domestic product has fallen by over 16% in Chile, compared with a 2% contraction in the recent U.S. recession.)

Here we make brief observations on the impact of deregulation in Chile. Some of the items need careful interpretation and we urge readers to consult the more detailed discussion in the main report.

- 1) Traffic: Growth more than doubled in the years immediately following deregulation. In 1983 the effects of the severe economic contraction gripped the industry and traffic fell to slightly under its pre-deregulation level.
- 2) Market Share: LAN Chile's roughly 75% market share fell to between 30 and 45% since deregulation (depending on how the market is measured).
- 3) Fares: Immediately before deregulation fares increased at the rate of inflation. Fares jumped immediately after deregulation but then stabilized. Overall after deregulation nominal fares rose while real fares (inflation corrected fares) declined.
- 4) Entry: No new passenger jet carriers have appeared. The privately owned jet carrier, Ladeco, has grown to equal the size of LAN Chile in domestic markets. A new all cargo jet carrier, Fast Air, has captured 6.5% of total industry revenues.

- 5) Employment: Employment at Ladeco and Fast Air has increased since deregulation. At LAN Chile the number of employees declined by half. This severe drop was the continuation of a trend at LAN Chile that began well before deregulation.
- 6) Service to Small and Isolated Communities: Communities with jet service have declined from 30 to 13. They have been replaced by third level air carriers. There were transitional interruptions during the first year of deregulation in some communities.
- 7) Profits: LAN Chile has continued to incur its usual substantial losses since deregulation.
- 8) Prospects: No changes in Chile's air transport laws are being considered at present. The CAB of Chile views deregulation as being a net success.

D. Regulatory Reform in New Zealand's Air Transport

In 1983, New Zealand passed legislation providing for a fast phase-in of deregulation. Under the new law, the government no longer regulates price, route entry, capacity, or type of aircraft. In its place the government only regulates the general licensing of air carriers. A license allows a carrier to provide any services within the country. Safety is of paramount concern to the new licensing authority. However, additional attention is directed towards a carrier's financing and its balance sheet. Failure to achieve or maintain financial or safety standards can result in the revocation of an air carrier's license.

Deregulation in New Zealand occurred in two phases. Phase one provided four months during which no new airline could enter the industry. This was intended to allow a period of adjustment for existing carriers without the immediate threat of new entry. During this phase existing carriers were allowed to expand and contract networks and to alter prices without having to request permission from the licensing authorities. Under phase two, any entity is allowed to operate air services within New Zealand if they meet the criterion for an operating license. Although deregulation is less than a year old in New Zealand a new carrier has already emerged. This carrier will operate tourist routes using two DeHavilland-7 aircraft.

The deregulation law in New Zealand provides for penalties should an air carrier set its fares or conditions of service in a manner intended to eliminate or seriously damage the business of an air competitor or to prevent its entry. Guidelines are given as to what constitutes an unfair practice and penalties are provided for should unfair practices be found. The new policy continues the existence of the state owned air carrier, Air New Zealand. It continues to provide domestic and international services. Although Air New Zealand is a dominant air carrier it does not operate a complete monopoly. It has had competition in the past several years, particularly on important routes.

Chapter 8: Cost Simulations

A. Introduction

In this chapter we describe the simulation of industry costs under alternative policy regimes. The vehicle for the simulations is the cost function we estimated using data for individual air carriers for the years 1964 to 1981. 1981 was the most recent complete data set available when we began our study in 1984. This cost function was described in Chapter 5.

B. Description of Simulation Variables

Variables needed for cost simulations include the expected amount of traffic in each of three categories, the prices of various inputs including labor and fuel, variables reflecting the stock of capital and the carrier will use, load factors, flight stage lengths and number of points served. We have adopted the approach of using 1981 as the base year for simulations. In our simulations we asked the question, "What would costs have looked like in 1981 under alternative regulatory policies?"

C. Description of Regulatory Policy Scenarios

In Chapter 3 we described each of the four regulatory policies we will investigate: Status Quo, May 10th, 1984, Advanced Liberalization, and Deregulation. In the main report we describe in detail the construction of the various simulations.

Under the May 10th policy we assume there would be a small increase in output for CP Air, no increase for Air Canada, and a 10% increase for the

regional carriers. We also feel this policy will lead to a better balance between scheduled and charter services for the regional carriers. Under advanced liberalization, with its program to subsidize services at small and isolated communities, we felt Air Canada would reduce the number of points it serves by ten percent. Corresponding to this would be a smaller reduction in output and an increase in the average stage length of its flights. Only a few changes were anticipated for CP Air under advanced liberalization. The regionals would start to add cities to their networks, particularly as Air Canada drops cities. This would result in an increase in their average stage lengths and an increase in their average traffic density. An even better balance between charter and passenger services is also expected for them. All carriers are expected to reduce their capital stock under Advanced Liberalization.

Under deregulation we anticipate a slightly greater decrease in the number of communities Air Canada serves. We expect the regional carriers will achieve a 30% increase in their traffic. They will also move to the optimal mix between charter and scheduled passenger services. We expect CP Air to achieve (roughly) a ten percent increase in output. All carriers would achieve substantial reductions in capital stock, especially Air Canada. Further, under deregulation we expect all carriers to reduce labor prices by roughly 15%. This would be due to the competitive pressures from new jet air carriers. These carriers only show up in the deregulation policy.

D. Shifts in U.S. Costs After Deregulation

Regulatory reform can lead to two types of economic changes. First, firms can achieve efficiencies by choosing the optimal mixes of traffic and of inputs. Second, firms can find innovative ways to reduce costs. Our simulations can handle the first type of efficiency. We, however, are unable to handle the second type of efficiency gain, at least when using only Canadian data.

We looked at the U.S. experience with deregulation to observe whether or not the second type of efficiency gain occurred in the U.S. We concluded that the evidence was too weak to substantiate such efficiency gains. Therefore, we chose to err on the side of conservatism in our analysis of Canadian deregulation, and did not attribute any of the second type of gain to our simulations of Canadian airline costs.

E. Results of Regulatory Policy Cost Simulations

The results, described in detail in the main report, can be summarized as follows:

- 1) May 10th Liberalization Policy: Cost efficiency of the industry would improve by 4.4% as compared to the status quo. Under this policy the cost efficiency of Air Canada, CP Air and the regional carriers is expected to increase 4.3%, 2.5% and 6.3% respectively.
- 2) Advanced Liberalization Policy: Cost efficiencies are expected to be 6.5% compared to the status quo. This is an improvement of 2.1% over the May 10th, policy. Air Canada, CP Air and the regionals are expected to increase their efficiency by 5.5%, 3.0% and 15.0% respectively.

- 3) Deregulation: This policy is expected to increase cost efficiency by about 8.8% compared to the status quo. This is an improvement of 4.4% over the May 10th policy and 2.3% over Advanced Liberalization. Air Canada, CP Air and the regionals would improve their cost efficiency by 9.2%, 5.0% and 12.5%, respectively.

We remind readers that in the simulations we have maintained the status of Air Canada as it is today. Specifically, under the May 10th, 1984 policy, Air Canada has been constrained in its ability to act competitively in Canadian airline markets. Thus we feel that other carriers will be able to grow at the expense of the Crown carrier. In subsequent sections we simulate results of changes in Air Canada's status.

F. Description of Crown Carrier Policy Scenarios

In the previous subsection we simulated alternative regulatory policies. In this subsection we consider alternative Crown carrier policies. In our simulation of alternative Crown carrier policies, we fix regulatory policy at the May 10th policy in order to isolate the effect of changes in Crown carrier policies. In Chapter 3 we described how we define each of the four policies toward Air Canada which we will simulate. Our base case Crown carrier policy is that which existed prior to May 10th. The first alternative Crown carrier is the May 10th, 1984 policy. The major change is the requirement that the carrier achieve private sector performance criteria before receiving additional equity capital. The second alternative is privatization without breakup. Under this policy we expect Air Canada to drop some of the small points on its network that are

unsuitable for jet operation. This will result in a modest increase in the carrier's average stage length. We also anticipate a major reduction in Air Canada's excess capital.

The third alternative is privatization with breakup into two pieces. Again we expect some reduction in the number of cities served. However, we expect the two pieces to have some overlap in the cities they serve, resulting in a reduction in the average traffic density. Again, we expect a major reduction in capital stock. The final alternative we consider is privatization in three pieces. Some overlap in the number of cities served by the three new carriers is again expected, as well as a major reduction in capital stock in total for the three pieces.

G. Results of Crown Carrier Cost Simulations

The results of the simulations of alternative policies toward Air Canada described in detail in the main report can be summarized as follows. First, we found that the May 10th policy toward Air Canada should result in a cost efficiency improvement of 3.1%. This occurs mainly through reducing the excess capital of Air Canada due to the application a more rigid financial test for accessing public funds. Privatization without breakup would result in Air Canada improving its cost efficiency by 10.6% relative to the pre May 10th, 1984 Crown carrier policy. This in turn provides incentives for CP Air and the regionals to improve their cost efficiencies. The sources of the efficiency gains for Air Canada are a significant reduction in its excess capital, dropping ten percent of the points it serves and a small reduction in the prices it pays for labour services.

Privatization with breakup in two pieces would reduce Air Canada's total cost by only 7.2%. This reduction is lower than the case where there is no breakup because the two new carriers must separately serve some identical points. This reduces the benefits of traffic density economies. Privatization in three pieces would reduce Air Canada's cost by 7.8%.

H. Descriptions of Alternative Industry Structure Simulations

In all of the above simulations we have maintained the current structure of the industry: Air Canada, CP Air and four regionals. In this section we explore the impacts of changes in the structure of the domestic airline industry.

We ask our readers to view these simulations as being suggestive rather than definitive. A complete consideration of the structure of the Canadian airline industry requires route specific demands as well as knowledge of costs. Due to the lack of data we are confined here to only looking at cost impacts of a few interesting hypothetical cases of restructuring the industry. In the main report, we describe the following industry structure simulations.

- 1) Transfer 1/3 of Air Canada to CP Air.
- 2) Transfer 1/2 of Air Canada equally to the other five carriers.
- 3) Two carrier policy: All regional carriers are to be merged with CP Air.
- 4) Merge CP Air and EPA.

I. Industry Structure Simulations

The industry structure simulations are described in detail in the main report. Here we summarise the main findings. Transferring 1/3 of Air Canada to CP Air is likely to reduce the total cost of the industry by 8.4% to 10.4%. The main source of this is increasing the traffic density of CP Air. Transferring one half of Air Canada to CP and the regionals could result in industry cost savings of 7.0% to 11%. The primary source of these gains is increasing the traffic density of CP Air and the regionals. Merging the four regional carriers with CP Air would likely reduce industry costs by 13.3%. This saving is achieved largely by consolidation of the number of points served, thus taking advantage of unexploited economies of traffic density. Some reduction in capital costs are also expected to occur. Readers should bear in mind that these simulations are hypothetical and ignore the impact of such restructurings on competition in the market. If restructurings such as these are to be seriously contemplated, a more thorough analysis using route specific demand data (unavailable to us) would need to be undertaken.

The merger of CP Air with EPA is expected to increase costs by about 3%. We note that CP Air is currently operating EPA as an independent airline. It has not actually merged the two carriers together. This hypothetical simulation must be interpreted carefully. We have assumed that the combined carrier services the same amount of traffic as the individual carriers. We must make these assumptions since we do not have available to us route specific demand information. If as a result of this merger, total traffic on the combined system increases, perhaps by mutually feeding the

two subsystems, there may be potential for exploitation of economies of traffic density.

J. Simulations of Regional Carriers Policies

In this section we explore the impact of changing the regional carriers' traffic mix, traffic levels, and stage lengths. The results are described in detail in the main report. The main conclusion is that reducing the proportion of charter services in total traffic would not decrease the cost of the carriers, unless charter output falls to less than 5-10% of total output. It appears that beyond 5-10%, airlines must procure aircraft specifically dedicated to charter services. Further simulations indicate that substantial cost savings could be achieved if the regional carriers are given access to a few routes with longer stages and perhaps some high density points. This would allow the regional carriers to make significant cost gains by exploiting economies of traffic density and stage length.

K. Summary

Table 1 summarizes the changes in unit cost expected for each of the alternative air transport policies we simulated.

Summary of Cost Reductions
Alternative Air Transport Policies

	Changes in Industry Unit Cost (Relative to Base Case)
<u>Regulatory Policy</u>	
• Pre May 10th Policy (Base Case)	-
• May 10th, 1984 Liberalization	-4.4%
• Advanced Liberalization	-6.5%
• Deregulation	-8.8%
<u>Crown Ownership Policy</u>	
• Pre May 10th Policy (Base Case)	-
• May 10th Policy	-1.8%
• Privatization Without Breakup	-6.9%
• Privatization With Breakup In Two Pieces	-4.9%
• Privatization With Breakup In Three Pieces	-5.3%
<u>Industry Structure Simulations</u>	
• Actual 1981 Structure (Base Case)	-
• Transfer 1/3 of Air Canada to CP Air (with reduction in # points served)	-10.0%
• Transfer 1/3 of Air Canada to CP Air (without reduction)	-8.4%
• Transfer 1/2 of Air Canada to All Carriers -equal shares	-7.8%
• Transfer 1/2 of Air Canada to All Carriers -proportional shares	-11.7%
• Two Carrier Policy	-5.1%
• CP Air - EPA Merger*	+3.0%

Table 1 (continued)

Summary of Cost Reductions
Alternative Air Transport Policies

	Changes in Regionals Unit Cost (Relative to Base Case)
<u>Regional Carrier Policy Simulations</u>	
• Transfer 50% Charter to Scheduled	+0.2%**
• Charter only 5% of Total RTK	-10.6%**
• Transfer 50% Charter to Scheduled and Increase Output and Stage Length by 50%	-16.4%**
• Charter Only 5% of Total RTK and Increase Total Output and Stage Length by 50%	-34.4%**

* This simulation ignores demand effects and thus requires careful interpretation. Cost reduction are reductions for the combined carrier, not for the industry. This simulation is different than the current status where CP Air and EPA are operated separately.

** Cost reductions are only for the sum of the regionals; not for the whole industry.

Chapter 9: Demand Simulations

Chapter 8 simulated industry costs under alternative regulatory policies. Here we combine those results with the demand elasticities of Chapter 6 to simulate total industry traffic levels. Table 2 summarizes the results. The first column gives the cost reductions determined in Chapter 8. The second translates these into industry traffic changes. The third gives the total traffic changes for the six carriers (Air Canada, CP, the four regionals) assumed in our cost simulations. The last column indicates the increase in industry traffic we expect to be served by "other" carriers. The results show that regulatory reform should lead to strong traffic gains for the "other" carriers, especially the third level carriers, perhaps Wardair and, under deregulation, a new jet carrier or two.

Table 2

Traffic Simulations

(Changes Relative to Pre May 10th, 1984 policy)

Policy	Cost Reduction	Total Traffic Increase	6 carrier Traffic Increase*	Other Carrier Traffic Increase
Pre May 10, 1984	-	-	-	-
May 10, 1984	4.4%	4.8%	2.3%	2.5%
Advanced Liberalization	6.5%	7.2%	-1.4%	8.6%
Deregulation	8.8%	9.7%	-2.0%	11.7%

*Recall that in these simulations Air Canada, which accounts for 60% of the total 6 carrier industry, is assumed to be constrained in its ability to compete.

Chapter 10: Regulatory Policy Choices

A. Introduction

In this chapter we draw together the various analytical findings concerning regulatory policy. These are combined with institutional detail to draw together what we believe to be a more complete picture as to how the industry will look under alternative policies. For each regulatory policy we held the Air Canada question at its May 10th, 1984 status. Details of our findings are in the main report.

B. Status Quo Policy (Pre May 10th, 1984)

We start by describing our findings concerning the historical policy prevailing in Canada. We find that most carriers exhibit constant returns to firm size, and that all carriers, with the exception of Air Canada, have unexploited economies of traffic density. Regional carriers have an inefficient output mix, too heavily weighted toward charter. Generally carriers have excess capacity, at least in part because the crown carrier established a service standard to be adhered to throughout Canada. Point to point (non-hub) networks are generally used. This is consistent with service maximization rather than cost minimization. Many small communities received jet service by the Crown carrier, Air Canada, even though it was not economically justifiable. Both fares and service quality levels have been high. Economic welfare is lower than it could have been due to cost inefficiencies and by not adequately serving low fare-low quality segments of the market. Finally, the public convenience and necessity test of the

regulatory regime has led to more stable profits than would have been the case without industry regulation. We have not observed excessive rates of return in the industry.

C. May 10th, 1984 Policy: Liberalization

We now turn to what we expect the ultimate impacts to be of the May 10th, 1984 "Liberalization" policy introduced by Lloyd Axworthy. Overall, we expect industry cost to fall by 4.4%. Traffic growth would lead to some gains due to the exploitation of traffic density economies, particularly by the regional carriers. The removal of license restrictions could allow some gains due to increasing stage lengths. The lack of exit freedom limits gains from rationalizing carriers' routes. The continuing existence of PCN limits achievement of gains by carriers entering markets better suited to their route and fleet structures.

New opportunities for the regional carriers in scheduled services should lead to gains from a more optimal scheduled - charter traffic mix. Overall, industry traffic is expected to rise by 4.8%. Traffic growth should be strongest in the longer haul markets where travelers are more responsive to price. There may be some movement to hub and spoke system network structures. This movement is limited due to the lack of exit freedom and incomplete entry freedom. The sheer size of Air Canada prevents any radical changes in the relative distribution of traffic among the other carriers. Some entry of third level carriers is expected. New jet carriers are unlikely due to the continued existence of PCN.

Consolidation of licenses and restriction removals could lead to the regionals entering some new routes. Charter freedom could also lead to some entry on routes. The dominance of Air Canada makes it unlikely that new participants in a market could become the major carrier. The lack of exit freedom and the north-south distinction of the policy assures continued service to small and isolated communities. Some fare reductions could occur when carriers exploit economies of traffic density. More price/quality options are expected, especially in long haul routes. Since entry by non-union carriers is unlikely (due to PCN), pressures on wages will not be great, except in anticipation of an eventual move toward complete deregulation. Increases in traffic could result in a net increase in employment. Economic welfare goes up due to the reduction in costs, the lowering of fares and the increase in traffic.

PCN will continue to provide some protection to air carrier profits, although their volatility should increase. This is due to the increase in competition. Transcontinental carriers, faced with entry by regionals and charters, may face the greatest pressure on profits.

D. Advanced Liberalization

The hypothetical Advanced Liberalization policy is expected to reduce industry costs by 6.5% relative to the pre May 10th, 1984 policy. As cost reductions are translated into fare reductions, industry traffic should increase by 7.2%. This growth in industry traffic is expected to be captured by carriers other than the six carriers existing today. In particular, we expect third level carriers to achieve high growth in traffic.

Air Canada's domestic traffic is expected to shrink, as (under the May 10th Crown carrier policy) its ability to compete is still constrained. Greater exit freedom should lead to increased adoption of hub and spoke networks. Carriers are expected to rationalize their route structures. Due to the continued existence of the PCN test, entry by new jet carriers is not likely to occur. Service to small and isolated communities may be replaced by turbo-prop service. Fares for non discretionary travelers may fall in some markets due to the provision for freer entry and one way charter services. More price-quality options are expected. Fare increases are likely in short haul markets. These will be offset by increases in service frequencies, although smaller aircraft will probably be used. Overall, there is an increase in economic welfare due to decreases in cost, the equivalent decreases in fares, and resulting increases in traffic.

E. Deregulation

Deregulation differs from Advanced Liberalization due to the removal of all entry, exit and fare controls, and the elimination of the public convenience and necessity test. Industry costs are expected to fall by 8.5% relative to the pre May 10th, 1984 policy. Carriers will be free to adapt the most efficient route structures for the markets they wish to serve. All carriers are expected to achieve gains by shedding excess capital. Cost decreases, translated into fare decreases, are expected to stimulate traffic by 10%. Air Canada is expected to lose significant amounts of traffic as it is assumed to be constrained in its ability to act competitively under the May 10th Crown carrier policy. Other carriers are

expected to capture the growth in the market. These include third level carriers, Wardair and perhaps a new jet air carrier or two. There could be some consolidation of existing regional carriers.

Economies of traffic density indicate that the number of carriers actually present in most of the high density markets will remain small; perhaps two per market plus an occasional specialized carrier. Regional carriers may judiciously enter a few long haul markets to reap profits from the feed they generate to such markets. Again, small and isolated community services are expected to be retained due to the subsidy program, although perhaps on non-jet aircraft. As costs are lowered, fares are expected to fall as well. However, some short haul routes will experience significant fare increases. These should be offset by increased flight frequencies. Carriers on such routes are expected to seek out high-fare time-sensitive travelers.

The presence of low cost, new jet air carriers are expected to produce some significant pressures on wages and work rules. Employment should increase, on average, due to increases in traffic growth. This will be offset somewhat by the removal of work rule restrictions. Individual carriers could have significant reductions in the number of employees. The employee relocation and retraining program would thus be put into action.

Overall, an increase in economic welfare is expected, due to a lowering of costs and significant increases in traffic. Welfare would be transferred from labour to consumers. Carriers are expected to earn normal profits as in other industries in the economy, but profits may be much more volatile.

Chapter 11: Crown Carrier Policy Choices

A. Introduction

The issue of policy toward Air Canada is inextricably intertwined with that of regulatory policy. Outcomes of regulatory policy reform depends on how Air Canada performs in Canadian markets. Similarly outcomes of alternative policies toward Air Canada depend on the regulatory environment. The dependence of regulatory policy and Crown carrier policy makes it difficult to determine the separate impacts of each on how the industry will behave. In Chapter 10 we attempted to isolate regulatory impacts by holding constant the Air Canada question. In this chapter we move in two directions. First, in section B, we examine impacts of changes in Crown carrier policy, holding constant the May 10th, 1984 regulatory policy. Second, in section C, we speculate on what the industry will look like when we marry both regulatory and Crown carrier policy.

B. Changes in Crown Carrier Policy Only

Privatization Without Breakup. Privatized Air Canada, even in a regulated environment, is expected to achieve some significant cost savings. These savings are conditional on the assumption that a privatized Air Canada will have no objective other than maximizing profits. Specifically, Air Canada will no longer be required to establish and maintain a high level of service throughout Canada, and it will be free to drop points not suited to the jet aircraft it operates. Our cost simulations indicate expected savings of 10.6% of its cost. The sources of these gains are:

a) reducing excess capital (it will no longer be required to set a high service standard in all markets), b) dropping some short stage length routes better suited to regional or third level air carriers, and c) a modest reduction in real wages. We found in Chapter 5 that Air Canada has no economies of firm size to exploit, and it has exploited most economies of traffic density. This suggests that it is unlikely to add any new Canadian cities to its network. It also suggests that it would not be likely to seek increased traffic density in existing markets. In other words, existing carriers should not have to worry about Air Canada attempting to gobble up the 40% of Canadian traffic it does not already have. Its doing so would not give it any cost advantage.

Privatization With Breakup. In this scenario Air Canada is broken up into two or three pieces, with each piece being sold to the private sector. Each piece consists of some regional routes plus transcontinental routes. The pieces are allowed to compete with each other, especially on transcontinental runs. Our cost simulations indicate that a two way breakup of Air Canada is likely to result in cost savings of 7.2%, while a three way breakup could result in cost savings of 7.8%. The reduction in excess capital is a major contributor to cost savings, as was the case for privatization without breakup. Unlike the previous case, however, fewer gains are expected from exploitation of economies of stage length. This is because each of the pieces is expected to have a strong regional affiliation and thus may find it desirable to maintain many of its shorter routes. Unlike the case of a large privatized Air Canada, the smaller pieces may

seek to improve their market shares. If the new carriers are successful in increasing their joint market share then this could be at the expense of other carriers, such as CP Air.

C. Changes in Both Crown Carrier and Regulatory Policy

When one changes both regulatory and Crown carrier policy, impacts become increasingly speculative. There is a common thread, however. A privatisation policy (with or without breakup), just like a move toward Advanced liberalisation or deregulation, involves an increase in competitive behavior in airline markets. A combination of the policies should lead to more of the benefits of competition (such as reduced costs, leading to lower fares, leading to traffic growth), and more of the costs of competition (dropping jet services at smaller communities, greater profit variability, asking the labour force for wage or work rule concessions).

The main points regarding joint policy changes in the main report are as follows:

- 1) Both privatisation and regulatory reform lead to lower costs.
- 2) If both occur at the same time, the speed at which markets adjust to new cost levels may be faster.
- 3) Cost reductions should be greatest with both deregulation and a breakup of Air Canada. This is particularly true if part of Air Canada is transferred to existing carriers, allowing them to reap traffic density economies.
- 4) A privatised Air Canada may be more apt to drop short stage length routes under the freedoms of Advanced liberalisation or deregulation.

- 5) The pieces of a broken up Air Canada could attempt to increase their market shares under greater regulatory freedom, possibly at the expense of existing carriers.
- 6) The pieces of a broken up Air Canada, due to their stronger regional affiliations, may be less inclined to drop small regional points from their regional networks.

Chapter 12: Ownership vs. Competition: What is Important?

We found in all of the analysis that the greatest proportion of effects result from changes in the competitive environment. While the cost simulations indicate substantial efficiency gains if Air Canada is privatized, these are due to relieving Air Canada of its burdensome social responsibilities of setting the national service standard, rather than from privatization per se. These gains could be obtained without privatization of Air Canada. It is the changes in the competitive environment which induces firms to increase capacity utilization, adjust the size and configuration of their networks, and lower input costs. The competitive environment is also responsible for the broadening of price/quality offerings, increasing service quality in short haul markets, and the entry and development of third level carriers.

Privatization and altering the size of Air Canada could play a role. While they are not necessary conditions for the efficiency improvements resulting from the changes in the competitive environment, they create opportunities or conditions for additional gains to be made. The adjustment process is faster with privatization than without.

We do not feel privatization is a necessary condition for the achievement of the gains from competition. What is necessary is that Air Canada is disciplined by the market for its actions. This requires no access to public subsidies, and constraining its ability to use its size to engage in predatory behaviour in markets. This is best achieved by good definitions and good enforcement of predatory behaviour rules. Breakup, while it alleviates the problem, does not do away with the need for such rules.



MAIN REPORT



PART I - THE INDUSTRY AND THE PROBLEM

In Part I, we (1) discuss the objectives of this study and the questions to be addressed, (2) describe the industry and its major problems, and (3) describe the transport policy options which we consider in this study.

Chapter 1: Introduction

What would the Canadian air transport industry look like if the country a) continues to take steps toward deregulation or b) if it privatizes or dismembers the crown carrier, Air Canada? These are the fundamental questions considered by this study. We are not the only ones seeking to address these issues. Other researchers and industry analysts before and, no doubt, concurrently with us have sought the answers. Our study, however, is distinguished from the others in two important respects.

First, our study relies primarily on Canadian data, Canadian models and knowledge of Canadian institutions. Many other studies draw heavily on the U.S. experience with its brand of deregulation. While the U.S. experience can be enlightening, it cannot be imported to Canada wholesale - i.e. without significant value added. The air transport systems in the two countries are distinctly different. Canada, for example, has a government air carrier which has been used as an instrument of public policy for forty years. It has 60% of the domestic market. In the U.S., where all air carriers are privately owned, no single firm has even 20% of the domestic market. We recognize that the U.S. experience is valuable. Indeed, we will draw on it when similar Canadian evidence is missing, or as a secondary support to conclusions drawn from Canadian data. Nevertheless, we believe Canadian policy questions should and must be addressed, where possible, by interpreting Canadian data and Canadian models within the context of the institutional setting of the Canadian airline industry.

Second, our approach combines a strong analytical base with interpretation based on common sense and knowledge of the Canadian airline industry. Many of the existing studies of the Canadian airline industry fall into one of two polar cases. The first assembles a myriad of detail on the institutional and policy setting of the industry and seeks to interpret these details into an economic argument for a change or maintenance of the status quo. This approach, in our opinion, lacks the objectivity and internal consistency one can obtain from attempting to model the industry. The second type of study develops a data base, estimates an economic or statistical model and (only sometimes) tries to interpret the results in a sterile manner devoid of the actual setting of the industry.

Our approach is to marry the two study types, retaining their individual strengths and hopefully leaving behind the worst of their weaknesses. We develop a Canadian data base. An economic model of Canadian industry behaviour is then estimated. This allows us to organize the myriad of details in a logical manner that results in all of the data being consistent with each other and with economic principles. We interpret the model (and use it for forecasting) in the context of the institutional setting of Canada's airline industry and the historical evolution of policy toward it. This "interpretive modelling" approach we believe to be the correct one to use. The model gives an objectivity so that the results are not wholly dependent on the analyst's own selective personal interpretation of facts. Using the model's results within the context of the actual industry gives common sense and plausibility to the conclusions.

We use economic efficiency as our measure of performance. We recognize that Canada, unlike the U.S., has a perspective of weighing efficiency

and equity issues in developing industrial policies. We argue that in the Canadian airline industry the ranking is efficiency first. We base this on the theme of the National Transportation Act of 1967, the focus on profit and efficiency contained in the New Air Canada Act of 1977, and the fact that Bill C-33, which would have changed the NTA of 1967, failed to receive parliamentary approval in the late 70s.

In the remainder of the chapter, we put the questions we seek to address in the context of today's air transport policy. We then state the specific objectives of the research, and finally we outline the approach we will take.

Policy Context of the Question

After May 10, 1984, the Canadian airline industry was governed by an air transportation policy which "relaxed" to some degree (and in some instances asymmetrically), many elements of previous regulatory policy. The changes were effected through a series of ministerial directives and orders-in-council rather than through legislative changes. Legislation was not used, at least in part, because the policy was viewed as an interim step in an ongoing dynamic process. That policy however has a number of unresolved issues. With the change in government in September, 1984, the dynamic aspects of this interim policy were stalled. As a result consumers, labour, air carriers and policy-makers themselves were left with some uncertainty as to which way the policy would evolve. Changes which the May 10th policy intended to bring about might not occur at all or could be tempered.

Among other things, the May 10th, 1984 policy eased conditions of entry by carriers to markets and liberalized carriers' ability to lower fares. While these changes made headway in allowing carriers to improve their economic performance (by altering behavior in certain markets) they did not create the environment or incentives for carriers (and thus the industry) to make the structural changes necessary for significant improvements. The loose strands of the policy indicate that the direction of future air transport policy is not fixed. Among the unresolved issues are:

- whether entry and pricing should be totally deregulated
- what role Air Canada is to play in the future, especially with respect to privatization and/or dismemberment of the carrier
- what should be done, if anything, with respect to the provision of air services to small and remote communities, especially those in the North
- should a safety net be set up if the policy is expected to dislocate members of the existing labour force
- what legislative changes are needed to accomplish the objectives of the new policy

The purposes of this research are twofold. First, we wish to provide an analysis of the May 10th, 1984 policy. Second, we wish to indicate a direction for future policy, particularly with regard to price and entry regulation, and the future role of Air Canada. Our analysis is based on a sound economic model of industry performance developed by researchers over a number of years. However, we have tempered and enhanced conclusions from the theoretical model with knowledge of Canadian Air Transport institutions, and with the practicality and common sense developed from being

students of the industry for several years. When appropriate, we cite the experiences of the U.S. (whose market is ten times larger than Canada), and Chile (whose market is ten times smaller). Both have encountered complete deregulation. We will also refer to the deregulation policy recently enacted in New Zealand.

Objectives of the Research

- (1) Identify a set of prospective air transport policies that are of greatest interest to policy makers. These will include the May 10th, 1984 policy, the previous policy as well as speculations on possible future policies.
- (2) Utilize the models developed in our previous work and those evolving in our current work to simulate the impact of specified policy changes on airline performance as measured by changes in total factor productivity (an efficiency measure) and unit cost.
- (3) Provide a summary picture of the changes which might be expected in the Canadian airline industry for each policy in terms of industry structure, performance, pricing and carrier structure (types of routes and other network aspects).

Approach

In this research we provide an analysis of both the May 10th and pre May 10th policies. (We arbitrarily refer to the latter as the "status quo"). In addition we define and assess two sequential policies, one which moves the industry to greater liberalization than the May 10th policy which we refer to as advanced liberalization, and the other which moves the industry to complete deregulation. Any analysis of Canada's air transport

policy cannot ignore Air Canada and its impact upon both policy and the industry. In our policy analysis we integrate alternative scenarios for Air Canada. These include the May 10th and pre May 10th policies and two privatization schemes, one with and one without breaking up the carrier.

We therefore end up with a matrix of combinations of regulatory policy and Crown Carrier policy. These are illustrated in Table 1-1. One should note as one moves in a southeasterly direction in the matrix the analysis becomes increasingly speculative.

These policies were identified after meeting with officials of Transport Canada, Canadian Transport Commission, Treasury Board, Consumer and Corporate Affairs Canada, Economic Council of Canada, Consumers' Association of Canada, Air Canada and other air carriers.

We utilize cost and productivity models to examine the effects of changes in output level and mix, load factor, stage length, and input prices on the level of cost in the industry. We separate inefficiencies which are likely the result of the regulatory environment from those that may be the result of poor management decisions. A very important aspect of our approach is the use of an estimated variable cost function rather than a total cost function. The latter, typically used in the past decade for industry studies, requires the strong assumption that firms employ the optimum amount of every factor of production. In an industry where Air Canada has several jets parked in the desert, and where some regional carriers had, at various times, under-utilized four-engine jets dedicated to charter services, we feel this assumption is untenable.

TABLE 1-1

Policy Matrix

Regulatory Policy	Crown Carrier Policy	Pre May 10, 1984 Status	May 10, 1984 Status	Privatization (no break-up)	Privatization (break-up)
Status-quo (pre May 10, 1984)					
May 10, 1984 Policy					
Advanced Liberalization					
Deregulation					

The variable cost function permits modelling in the case where carriers have more or less than the optimum amount of capital. Our estimation of the variable cost function confirms and quantifies the observation that most Canadian air carriers currently have too much capital. Use of the variable cost function allows us to simulate the impact of carriers moving toward optimum capital levels.

For each simulation we draw up a summary of the results under the following headings.

1. Carrier and industry performance as measured by total factor productivity and costs.
2. Output levels and mix.
3. Network patterns.
4. Industry structure.
5. Market structure on dense routes.
6. Service to small and remote communities.
7. Fares and service quality on dense and thin routes and long and short-haul routes.
8. Air traffic volumes.
9. Employment, work rules and factor prices.
10. Total welfare change.
11. Carrier and industry profitability (stability).

Using this framework we establish or at least speculate about which variables and hence which elements of policy, contribute most to the increase in efficiency. We would like to then take these cost reductions

and translate them into specific fare reductions and thus traffic volumes (which in turn will affect costs). Since we as yet do not have a complete model of demand for Canadian air transport services we cannot adopt an integrated or "closed" model. Instead, we must speculate on how the integrated model will behave, drawing on evidence from Canadian demand models we have estimated and U.S. models of demand (where the required data are publicly available).

Chapter 2: Description of the Industry

Any study of air transport regulatory reform and public policy should begin with an understanding of the industry and its institutions. In this chapter we describe the structure of the Canadian airline industry and its major carriers. Many previous assessments of Canadian airline policy have used the outcome of the U.S. experiment with deregulation to support arguments for similar moves in Canada. While it would be certainly naive for one to assume that the U.S. results are directly transferable to the Canadian situation, there are nevertheless some lessons to be learned. To determine what could or could not be transferred, important differences in the industry structure between the two countries must be addressed. Accordingly, in this chapter some emphasis is placed on comparisons with the U.S.

A. Industry Organisation

Table 2-1 provides a cross-section summary of the Canadian airlines, while Table 2-2 compares these Canadian carriers to the U.S. Carriers. Three important differences are apparent between the U.S. and Canadian airline industries. First, the Canadian industry is much smaller than the U.S. industry. This is not surprising, given that Canada has roughly one tenth the population that the U.S. has. Total revenues for the U.S. carriers included in Table 2-2 were US\$15.6 billion as compared to Canadian industry revenues of US\$3.1 billion. In fact, there are 6 U.S. carriers, each of which has revenues that exceed the sum of revenues for the 7

Table 2-1
Description of the Canadian Airlines Carriers
Ranked by 1982 Revenues

	1982 Revenues (millions of Canadian \$)	% of Total	Passengers Carried (millions)	% of Total	1982 Revenue Tonne-kilometers (millions)	% of Total	1982 Ratio of Charter to Total Tonne-kilometers
Transcontinental Carriers							
Air Canada	2,171	544	11.77	524	2559	530	5.54
CP Air	851	22	3.71	16	1245	26	12.96
Regional Carriers							
Pacific Western Airlines (PWA)	315	8	3.49	15	243	5	36.10
Wendair	113	3	.79	4	114	2	50.30
Western Provincial Airlines (WPA)	93	2	.79	4	75	2	4.10**
Quebec	60	2	.61	3	48	1	41.30
Charter Carriers							
Wendair	271	7	1.30	6	542	11	100.00
Total	3,683	1004	22.54	1000	4826	1000	

* In December, 1983 all but 1% of PWA was sold to the public. A condition of the sale was that no person or group of persons other than the Province of Alberta control more than 4% of PWA's voting stock. Alberta has since reduced its holdings to 4%.

** WPA has reduced its charter traffic in recent years. This ratio was 21%, 20% and 7% in 1978, 1979 and 1980 respectively.

† Ownership of WPA was transferred in 1984 from Newfoundland Capital Group to CP Air.

Sources: 1982 Traffic Statistics and 1982 Financial Statistics, International Civil Aviation Organization; Wendair 1982 Annual Report; Western Provincial Airlines.

Table 2-2

U.S. and Canadian Carriers Ranked by 1982 Revenues

Rank	Carrier	1982 Revenues (Billions of U.S. \$)	1982 Passengers (Millions)	1982 Revenue Tonne-Kilometers (Billions)
1	United	4.614	33.17	
2	American	3.978	27.78	6.79
3	Eastern	3.769	35.62	5.48
4	Delta	3.632	33.83	4.31
5	Pan Am	3.471	13.31	4.06
6	TWA	3.236	17.71	5.92
7	Northwest	1.888	11.59	4.39
8	** Air Canada	1.756	11.77	3.43
9	Republic	1.531	18.23	2.56
10	Continental*	1.415	13.29	1.44
11	U.S. Air	1.273	14.99	1.98
12	Western	1.065	10.17	.95
13	Flying Tigers	.878	.31	1.52
14	** CP Air	.688	3.71	3.19
15	Piedmont	.655	8.54	1.24
16	Frontier	.538	6.00	.60
17	Osark	.407	4.37	.55
18	PSA	.378	7.10	.35
19	Braniff	.360	3.92	.40
20	Southwest	.331	9.08	.52
21	Air Florida	.282	2.75	.44
22	World	.267	1.65	.39
23	Capitol	.267	1.82	.69
24	** PWA	.255	3.49	.62
25	Transamerica	.240	.49	.24
26	Alaska	.235	1.56	.70
27	** Wardair	.220	1.38	.23
28	Air California	.215	3.49	.62
29	Wien Alaska	.178	.95	.21
30	People Express***	.139	2.66	.15
31	Hawaiian	.100	3.18	.21
32	New York Air	.095	1.74	.06
33	Midway	.095	1.03	.09
34	** Nordair	.091	.79	.08
35	Aloha	.081	2.43	.11
36	** EPA	.075	.79	.49
37	** Quebecair	.056	.61	.08
38	Muse Air	.033	.41	.05
Total U.S.		35.646	293.17	50.27
Total Canadian		3.141	22.54	4.90

* Includes Texas International

** Denoted Canadian Air Carriers. An exchange rate of US\$ = .808898 Canadian\$ was used. This is the exchange rate used in 1982 by the International Civil Aviation Organization.

*** People Express 1983 data are \$.292 billion revenue, 5.70 million passengers and .59 RTK.

Canadian airlines. Air Canada, the largest of the Canadian airlines, ranks number 8 in the combined U.S. and Canada air carrier list. CP Air is roughly the size of Piedmont, a medium-sized U.S. national carrier, and PWA, the third largest Canadian airline, is smaller than any of the pre-deregulation U.S. scheduled interstate carriers and as of 1983 was smaller than People Express, one of the "new entrant" U.S. carriers.

The second difference between the two countries is that the Canadian airline industry is much more concentrated. See Table 2-3. United Airlines, the largest U.S. carrier, accounts for 13% of U.S. industry revenues and 14% of its revenue tonne kilometers (RTK). Air Canada on the other hand, accounts for 56% and 53% respectively. These comparisons hold, even if we make pre-1978 comparisons, when the soon-to-be-deregulated U.S. industry had a slightly higher level of concentration. If we look only at domestic traffic, Air Canada provided 60% of Canadian RTK while United provided 18% of that in the U.S. As can be seen, by any measure, Air Canada dominates Canadian air transport.

The third difference between the U.S. and Canada is that the Canadian airline industry has a high degree of government ownership. In the U.S., all airlines are privately owned and have always been privately owned. Air Canada has been 100% federally owned since its inception. Its directors are appointed by the Federal Cabinet.

PWA, the third largest Canadian carrier, started as a privately owned airline with a base in British Columbia. In 1974 the Province of Alberta acquired 100% ownership of PWA. Its headquarters were then transferred to Alberta. PWA now operates extensive networks out of both Calgary and Edmonton in Alberta as well as Vancouver, B.C. and Winnipeg, Manitoba. At

Table 2-3

Comparison of Largest Carrier to Industry as a Whole

Canada and U.S.

1982 data

	System Wide		Domestic Only	
	<u>Total Revenues</u>	<u>Total RTK</u>	<u>Total Revenues*</u>	<u>Total RTK</u>
Air Canada				
as % of Total Canada	56%	53%	59%	60%
United Airlines				
as % of Total U.S.	13%	14%	16%	18%

* Source for Domestic Canadian data are Annual Reports of Air Carriers.

least in part to enable the carrier to finance growth through equity, PWA was sold to the public in December, 1983. The province retained 15% of the shares, and added a condition to the sale that no individual or entity could exercise control over more than 4% of the outstanding voting shares of stock. (The province has since reduced its holdings to 4%).

Nordair also started as a privately owned carrier but was acquired by Air Canada in 1978. Nordair, however, was not merged into Air Canada. It continued to operate as a subsidiary. The federal cabinet stipulated that Nordair was to be sold within a year of its acquisition. Although some bids were received, none were accepted. As part of the New Canadian Air Policy announced on May 10th, 1984, Air Canada was to divest itself of its 85% of Nordair as soon as possible. Bids were received and the Federal Cabinet approval of sale to Innocan Inc. set the process in motion for a return of Nordair to the private sector. Air Canada, however, might retain some indirect control since its pension fund owns 30% of Innocan.

Similarly, Quebecair started as a private operation. In recent years it experienced financial difficulties and the government of Quebec started to acquire and exert control over it. Effective control was obtained in July, 1981, and private interests were bought out in 1983.

Of the six Canadian carriers providing scheduled services, only CP Air, owned by the giant conglomerate CP Limited, and EPA have been purely private operations. In April, 1984, CP Air announced its acquisition of EPA (pending CTC approval) and CP's intention to operate it as a separate entity. A seventh carrier could be added to this list, Wardair. Privately owned Wardair does not operate scheduled services. It is purely a charter carrier. Traditionally, it has shifted its fleet from popular sunspot

destinations in the winter to transcontinental and international flights in the summer. Wardair has been successful in pressing for removal of some of the government imposed constraints designed to fence off low fare discretionary travel from higher fare "must-go" traffic; constraints such as advance purchase and minimum stayover requirements. The carrier is now able to sell up to one third of its seats without advanced purchase or reservations. Much of Wardair's traffic travels at fares more than 50% below standard economy fares for scheduled service.

B. Route Structures

Having discussed the organization of the industry, we now wish to comment on the mix of traffic served by the carriers. Air Canada services the bulk of Canada's transcontinental traffic and operates several purely regional routes as well as international routes, especially to Europe. Similarly, CP Air provides transcontinental services, operates a sizable feeder network to small cities around a Vancouver hub, and carries international traffic to the Pacific rim and Europe. Both Air Canada and CP Air provide modest amounts of charter services in off-peak periods.

The regional carriers do not provide any international scheduled services other than a few "transborder" routes to the U.S. The four carriers operate purely regional route structures. PWA, the largest, operates out of hubs in Vancouver, Edmonton, Calgary and Winnipeg. EPA's network is largely focused on the Maritimes. Nordair serves northern Ontario and areas of Quebec northwest of Montreal, while Quebecair operates routes northeast of Montreal. PWA serves a few transcontinental routes, but had

been restricted to multistop service. Multistop or capacity restrictions have also been applied in the past to many of the routes that link up its four hubs.

In contrast to Air Canada and CP Air, the regional carriers (except EPA in recent years) have operated substantial amounts of charter services as shown by the last column of Table 2-1. This is not surprising, given the lack of growth opportunities for the regionals in the more highly regulated regional markets for scheduled traffic. The Regional Carrier Policy, in effect from the mid 1960s until May 10th, 1984 had confined the regionals to specific geographical areas with little ability to operate in markets with other carriers. As is well known, firms operating in both regulated and (relatively) unregulated markets will shift resources to the latter if profit potential is greater. Consistent with this, some of the regional carriers purchased aircraft better suited to the type of routes on which they provide charter services than to their regional scheduled routes.

Wardair operates only charter services. Its fleet consists of four 747's, and three DC-10's. Although Wardair technically does not compete with the transcontinental carriers, in fact it has the ability to provide daily service on the routes. This is true of some major international routes as well.

Canada has approximately 75 third level carriers operating routes linking small communities to an airport served by a regional or transcontinental carrier. These carriers differ substantially. Trans North Air provides services in the Yukon and Northwest territories. Air BC links several small cities in British Columbia with Vancouver. Air Ontario

operates services out of Toronto to medium size cities such as London and Ottawa, often in competition with one of the larger carriers.

C. Policy Evolution

Several excellent and detailed histories of Canadian Air Transport Policy exist. For readers requiring some policy background, we provide some excerpts from the overview provided in Oum and Tretheway (1984).

Historical Phases of Canadian Economic Regulation and Policy

Federal regulation of Canadian air transport began with passage of the Transport Act in 1938.¹ This act established the Board of Transport Commissioners (BTC) with authority over rail as well as the air mode. The board could and did act independently of the Minister of Transport. Because it did, the BTC was replaced in 1944 by a new body, the Air Transport Board (ATB), reporting directly to the Minister.²

The ATB continued in its role as regulator of air transport until the 1967 National Transportation Act (NTA) created the Canadian Transport Commission (CTC). The Air Transport Committee (ATC) of the CTC replaced the ATB as economic regulator of the nation's airlines. In keeping with the multimodal spirit of the NTA, members of the air transport committee also sit on CTC committees governing other modes. The ATC enjoys a degree of autonomy from the government but not to the same degree that the U.S. Civil Aeronautics Board did. As discussed below, the government has the right to vary or rescind actions by the ATC thus reducing the latter's independence.

Regulatory policy toward commercial air transport has evolved through the following three phases:

- 1) From 1936 to about 1960, the regulators were exclusively concerned with developing a large network of reliable, commercially viable, scheduled passenger services. To this end Trans-Canada Airlines (currently Air Canada) was given a protected monopoly on the main-line transcontinental routes until 1959.
- 2) During the 1960s and early 1970s, both carriers and regulators began to recognize the potential of discretionary travellers. Economic regulation focused on maintaining the separation between charter services for discretionary travellers and scheduled services for "must go" traffic. In addition, the current regional air carrier policy, described below, began to take shape in the mid-1960s.
- 3) Since the mid-1970s, policy has tended to ease some of the restrictions on the carriers. Restrictions on charter operations (both domestic and international) began to be reduced, and charter class fares were permitted on scheduled flights (with restrictions such as advanced booking, minimum stay, and cancellation conditions). The gradual easing and eventual elimination (in 1979) of all restrictions on CP Air's capacity on transcontinental routes has increased that carrier's ability to compete with Air Canada.³ Another significant development has been the 1977 amendment to the Air Canada Act which places Air Canada on an equal footing with other carriers under the CTC's regulatory control. Furthermore, the new Air Canada Act instructed the carrier to be market-oriented and profit-seeking.

Regulation and Regulatory Practices in Canada Prior to May 10th, 1984

In Canada, the regulation of civil aviation (both inter- and intra-provincial) is under the exclusive jurisdiction of the federal government. Economic regulation is administered by the Canadian Transport Commission (through its Air Transport Committee) while safety regulation is handled by the Ministry of Transport (known as Transport Canada). The National Transportation Act established the CTC as an independent regulatory body, reporting to Parliament through the Minister of Transport but not accountable to the executive branch of the Government for its decisions.

The Aeronautics Act, first enacted in 1922 and amended several times thereafter, provides today's ATC with extensive regulatory powers over commercial aviation, encompassing such facets as control of fares, entry and route licenses, types and conditions of service, merger and acquisitions, as well as abandonments of service. Section 16 of this Act gives the ATC the legislative powers for making the Air Carrier Regulations which have the same effect as law. In exercising its regulatory powers the ATC operates within rather general criteria set out in the statutes. For example, in licensing commercial air services or responding to new route applications, the ATC must determine under Section 7 of the Air Carrier Regulations whether the proposed service "is and will be required by the present and future public convenience and necessity" (PCN). In making its decisions the Committee is also required to achieve the national transportation policy objectives set out in Section 3 of the NTA. These are "an economic, efficient and adequate transportation system making the best use of all available modes of transportation at the lowest total cost."

With respect to Air Canada, the licensing powers of the ATC were limited until 1977 by the Air Canada Act. Prior to 1977, the Commission had been required to license Air Canada for any services agreed to between the airline and the Minister of Transport under the Air Canada Contract.⁴ Due to its federal ownership, Air Canada is still required to comply with general directives of the Governor-in-Council (i.e., the Cabinet).⁵

The ATC, in some instances, imposes detailed restrictions on a carrier's license or amendments to its license, by specifying frequencies, intermediate stops, the type of aircraft that can be operated, the types of traffic to be carried, and operating restrictions by season or by time of day. Usually capacity restrictions and number of stops are specified.

Section 64 of the NTA allows the executive branch of the federal government (Governor-in-Council) to "vary or rescind any order, decision, rule or regulation of the Commission, -- whether such regulation is general or limited in its scope and application; and any order that the Governor-in-Council may make with respect thereto is binding upon the Commission and upon all parties".⁶ In addition, Section 25 of the NTA gives the Minister of Transport the power, on appeal, to overrule any licensing decisions of the ATC. The NTA makes no provision for government directives to the ATC concerning the latter's exercise of regulatory authority. In practice, however, the power of the Government to "vary or rescind" anything done by the ATC gives the Commission a special incentive to take serious account of Government policy. Because of this, the Minister of Transport and the Cabinet have influenced the ATC's regulatory decisions by issuing official

policy statements or directives. With a few exceptions, such Government policy directives are typically phrased in very general terms. This leaves it to the ATC to determine how the policy intent can best be implemented and thus does not undermine the mandate of the ATC to make specific determinations of "public convenience and necessity."

As a specific example, the ATC in exercising its licensing powers has generally taken into account pertinent government policy statements relating to the roles of the National (transcontinental) and Regional carriers. This series of statements in the 1960s confined the five (currently four) regional carriers' networks to their respective geographical areas with minimum overlap.⁷

In cases where such direct policy guidance has been lacking, the Committee's decisions have exhibited a strong (perhaps excessive) concern to assure the public of stability and continuity of service. The burden of proof that a particular license application will enhance the present and future "public convenience and necessity" has been placed on the proponents of the new service, and not on the intervenors in opposition (usually existing carriers).

A final aspect of the current regulatory environment concerns enforcement of anticommon (i.e. antitrust) legislation. There appears to be some question as to whether crown corporations, such as Air Canada, are subject to enforcement under the Combines Investigation Act (CIA). This law, prohibiting predatory pricing by firms, is of little relevance to air transport as long as the ATC regulates fares. It would however be crucial in a deregulated environment where Air Canada would start with a dominant position. In March, 1984, the government introduced a comprehensive set of

amendments to the CIA in Parliament, including a provision that would make all crown corporations subject to the CIA.

Notes to Chapter 2

1. Responsibility for civil aviation rested with the Ministry of Defense until 1936 when it was transferred to the newly created Department of Transport. The Air Transport Board Act of 1919 (replaced in 1922 with the Aeronautics Act) provided for economic regulation of air transport. This authority was generally not exercised until 1938.
2. The ATB was created largely in response to the willingness of the BTC to implement the Minister's wishes. The precipitating event was the BTC's award of the Vancouver-Victoria route to CP Air, in spite of clear statements by the Minister that it should be awarded to TCA.
3. Up until 1959, Air Canada had a monopoly on the transcontinental routes. In 1959 the ATC permitted CP Air to enter the transcontinental market, Vancouver - Toronto/Montreal/Ottawa, but limited its capacity to 25% of total transcontinental capacity. Further, all of its transcontinental flights had to terminate in Vancouver or Montreal. In early 1974 the Minister of Transport announced that CP Air was to be relieved of the latter requirement. The airline was allowed to turn around at points in Western Canada on flights from Vancouver, Ottawa, Montreal or Toronto. In mid-1977, the Minister announced that CP Air's capacity share was allowed to increase to 35% of the market's growth in 1978 and to 45% of the growth in 1979. In May 1979, on specific Ministerial direction, all capacity restrictions on CP Air's share of the transcontinental market were dropped.
4. It should also be noted that TCA was the only Canadian airline whose route authority was derived from the Canadian parliament, rather than from the regulatory agency.
5. The Cabinet, consisting of the Prime Minister and all the other government ministers, is also known as the Governor-in-Council. Directives from the Governor-in-Council are referred to as "Orders-in-Council."
6. For example, the ATC's decision to permit CP Air to enter the Toronto-Halifax route in late 1978 was varied by the Cabinet in mid-1981 to award non-stop service to Eastern Provincial Airways. CP Air was down-graded to one-stop service but was permitted to fly non-stop Montreal-Halifax and Ottawa-Halifax, routes it had not applied for. In January 1983, CP Air and EPA combined operations on these routes.

7. April 24, 1964 and June 1, 1965, "Statement on Civil Aviation Policy"; August 15, 1969, "Regional Air Carrier Policy." The regional carrier policy confines the five regional carriers to specific geographical regions:

PWA:	B.C. and Alberta
Transair:	The Prairies and Northwestern Ontario
Worlair:	The remainder of Ontario and Northwestern Quebec
Quebecair:	Quebec east of Montreal
EPA:	The Atlantic Provinces

Transair was acquired by PWA in 1979. As a condition of the acquisition PWA had to give up nonstop authority on the route linking Winnipeg to Toronto.

Chapter 3: Transport Policy - Options for Consideration

A. Introduction

In this chapter we identify and spell out the alternative policies considered in this research. Alternative policies have two dimensions as was indicated in Table 1-1. In the first dimension we vary the regulation of Canadian air transport. In the second dimension we vary the structure (i.e., size) and ownership of the crown airline, Air Canada. We thus define a matrix of policy alternatives consisting of various pairings of regulatory reform and various forms for the crown carrier, Air Canada.

All policies are compared relative to the status quo. Given the recent May 10th, 1984 New Canadian Air Transport Policy, the definition of the status quo needs to be made explicit. With the September, 1984 change in Federal government following shortly after the May 10th policy, and with a clearly different point of view being expressed by the Canadian Transport Commission (CTC) than the then Minister of Transport, we feel that the May 10th policy is not unanimously accepted. Therefore, we define the status quo regulatory policy as the pre May 10th, 1984, regime. This allows us to compare the May 10th policy relative to its predecessor and to compare other alternative policies with respect to the full regulation case.

In choosing which specific policies we should analyse in this project we endeavoured to consult with a large number of parties having an interest in Canadian air transport policy. We spoke with individuals in the Minister's Office of Transport Canada (Lloyd Axworthy was NOT at the time of these interviews), and with the Canadian Air Traffic Administration. At

the CTC we spoke with individuals in the research branch and at the Air Transport Committee. Other government agencies consulted included the Economic Council of Canada, Consumer and Corporate Affairs of Canada, and the Treasury Board. Outside of government we talked with representatives of the Consumers Association of Canada. We have also spoken on various occasions and in various contexts with airline executives of Air Canada, CP Air, PWA and Wardair. In all of our discussions we solicited opinions as to which air transport policies Canada might consider in the future. We asked basically two questions: 1) How did they perceive air transport policy moving in the future? and 2) How should the existence of Air Canada be handled?

The consensus that emerged during the summer of 1984 was that there would be no turning back from the May 10th, 1984 policy, even if the government changed from Liberal to Conservative. There also seemed to be general agreement that privatization of Air Canada was not a foregone conclusion, but that what was done with Air Canada would affect the success of further plans to deregulate or liberalize Canadian air transport.

Each individual painted a slightly different picture of alternative policies that could emerge in Canada. Nevertheless, all of the proposed policies fell into a few fairly general categories. Specifically, full deregulation was considered as well as some intermediate step between full deregulation and the May 10th, 1984 policy. Most individuals felt that a consideration of the pre May 10th, 1984 policy would be useful as it would provide a perspective on the current policy. With regard to Air Canada, the opinions all dealt with the general questions of, 1) whether Air Canada

should be privatized and if so how much of it should be privatized, and 2) whether Air Canada should be broken up into various pieces.

In Section B below, we detail the specific policies we looked at with respect to regulation. In Section C we detail alternative policies that might emerge toward Air Canada.

B. Regulatory Policy: Four Options for Consideration

Policy One: Status Quo (Pre May 10th, 1984)

We define the status quo regulatory policy as that which existed prior to May 10th, 1984. Specifically, this policy encompasses the following:

- complete regulation of entry into the air transport industry as an airline company;
- complete regulation of which air routes a carrier can fly;
- selective regulation of conditions on service on air routes, including frequency of service, capacity offered, type of aircraft, and intermediate stop requirements;
- complete regulation of airfares;
- regulation of conditions/fences surrounding discount airfares;
- regulation of exit from all markets in Canada;
- regulation of geographical regions within which an air carrier may provide service;
- regulation of the level of service an air carrier can provide (i.e., local service, regional service, transcontinental and international).

Of paramount importance in the status quo policy is application of the public convenience and necessity (PCN) criteria for entry into (and

exit from) city pair markets. In determining PCN, the benefits of competition have less weight in the status quo policy than in the alternative May 10th and advanced liberalization policies considered below. Capacity regulation is included as an essential element of the status quo of Canadian air policy. This is to prevent the scheduling competition type of inefficiencies that occurred in the United States prior to its deregulation. Prices are regulated according to a rate of return criteria. Special attention is given to protecting an air carrier's revenue base. This is done, in part, by erecting mandatory government restrictions on discount fares. In the status quo policy, Air Canada is charged with maintaining profitable operations and is subject to the same form of regulation as all other air carriers vis-a-vis the CTC.

Policy Two: The May 10th 1984, New Canadian Air Policy

This policy, the current policy in effect in Canada, is characterized by the following points:

- Canada is divided into two regions: North and South;
- all of the old regime rules apply to northern Canada;
- unlimited entry into round trip charter markets in southern Canada;
- freedom of exit for incumbent carriers in the South only when faced with new entry;
- exit from market continues to follow the PCN criterion except when faced with new entry;
- removal of all restrictions on conditions of service on airline routes. Specifically, removal of capacity, equipment type, number of stops, and frequency of service constraints on any given route;

- in southern Canada unlimited freedom to reduce prices;
- price increases allowed up to the rate of inflation of an input price index excluding labour (additional price increases may be applied for from the CTC);
- removal of mandatory booking and travel restrictions on discount fares;
- Air Canada restricted from engaging in competitive pricing and scheduling practices unless private carriers are doing the same;
- Air Canada cannot receive funds from the government unless it meets "accepted financial tests";
- abandonment of Regional Carrier Policy.

The thrust of this policy is to provide for an increase in entry into major Canadian markets, as well as to provide freedom for pricing decreases. The structure of regulation still remains. However, the benefits of competition are to be given greater weight in determining the public convenience and necessity of proposed new air services. The May 10th policy is specifically intended not to be complete deregulation. Applications for new entry and pricing increases are expected to be subject to a non-trivial amount of regulatory lag. This was intended to give incumbent carriers opportunities to adjust and plan strategies. By not allowing unlimited new entry, this policy is also intended to protect labour (which might have been receiving rents under the status quo regulatory regime). The overall intent of the policy is to introduce elements (and presumably benefits) of competition, but on a slow, "made in Canada" basis.

Policy Three: Advanced Liberalisation

This policy provides an intermediate stage between full deregulation and the current policy of May 10th, 1984. It is intended to reduce the

protection of incumbent carriers from market forces without exposing them to the complete volatility of deregulation. The main thrust of advanced liberalization is to provide additional moves towards entry and exit freedom, and to start to provide some ability to raise prices without prior regulatory agency approval. The policy does not go completely to deregulation. In particular, advanced liberalization maintains the public convenience and necessity test for entry and exit into markets. As such, much of this policy could be implemented in Canada without seeking legislative change. This policy is characterized by the following additions to the May 10th, 1984 policy:

- the benefits of competition are to be given greater weight in determinations of exit petitions in specific markets (including benefits in other markets);
- carriers operating aircraft with 36 or fewer seats are exempted from all forms of route and pricing regulation;
- carriers are to be given freedom to raise fares 30 percent above a reference fare level in markets less than 500 kilometers and 15 percent in markets between 500 and 1,000 kilometers.
- carriers will be allowed unlimited freedom to enter one way charter markets;
- northern Canada is subject to the same policies as southern Canada (specifically northern Canada loses its protection from entry, exit and pricing regulation);
- a small and isolated community subsidy program is to be instituted.

This policy differs from complete deregulation in several important respects. Carriers do not have complete freedom to raise prices, especially in long haul markets. Entry and exit are not unlimited. Carriers must still go through the formalities of applying for entry and exit and the criterion of public convenience and necessity continues to apply.

Because of these restrictions it is expected that this policy is not likely to result in significant entry of new jet airlines. Nor do we expect this policy to result in overly volatile movements in and out of specific markets.

This advanced liberalization policy is intended to address several of the deficiencies of the May 10th, 1984 policy. One of those deficiencies is an incentive for carriers to reduce or abandon service in short haul markets. Some researchers have argued that under the status quo regulatory policy, carriers cross subsidized short haul routes from long haul routes.¹ This cross subsidy is present in the fare costing formula used by the CTC. Under the May 10th, 1984 policy, carriers were given the opportunity to reduce fares in long haul routes. Consumers of those routes may of course benefit from this. However, it can also lead to a loss of the cross subsidy to short haul markets. Since carriers do not have the same freedom to raise fares in short haul markets as they have to lower fares in long haul markets, carriers might perceive that opportunities are very poor in short markets. Furthermore, it has been argued that in a deregulated environment carriers generally serve short markets by charging high fares and offering very frequent service. This is in order to compete with other modes, specifically automobiles. The advanced liberalization policy provides carriers with some flexibility to raise fares in a real sense in short haul markets. Very short markets which face heavy competition from automobiles are given greater freedoms than intermediate length markets. At the same time, freedom of entry is offered to third level carriers with the intent of providing competition in these short haul markets to keep services as good as possible and fares as low as possible.

Another weakness of the May 10th policy was the indirect discouragement of entry with innovative services. Because carriers do not have the same exit freedom as they do entry freedom, they might perceive that an experimental service, if unsuccessful, could result in being forced to continue to service the market pending lengthy regulatory proceedings. This discourages carriers from offering such innovative and experimental services in the first place. The advanced liberalization policy is intended to provide the same freedoms for exit that it provides for entry.

A third weakness of the May 10 policy was the potential for carriers to abuse the North/South distinction. The May 10th policy segregated the North from the South and continued to protect the North under the old regulatory regime. One could envision cases where a carrier serving both northern and southern markets, could ask for fare increases in the north in order to subsidize a fare war in the south. The advanced liberalization policy eliminates the North/South distinction to prevent such abuse. We recognize that the original intention of the North/South distinction was to protect isolated communities. Under the advanced liberalization policy we introduce a small and isolated community subsidy program to ensure the continued existence of such service.

The small and isolated community subsidy program will provide subsidy to communities which an incumbent carrier wishes to exit. The CTC is to determine the amount of such subsidy, and since the PCN test for exit continues, incumbent carriers can be obliged to continue service even if they do not desire to do so. The CTC, however, may elect to solicit bids for subsidized service from other air carriers. In choosing the carrier to receive the subsidy and serve the community, the CTC is not confined to

choosing the carrier with the lowest bid. Specifically, if the CTC determines that a higher bid offers a significantly greater level or reliability of service, it may elect to choose that carrier. It will be necessary for the government to provide sufficient funds to administer this program, although the U.S. experience with such a program suggests that the amount of subsidy may be modest. Total U.S. subsidies in 1983 were US\$58 million, including \$4.3 million for subsidy at 26 Alaskan communities. A fifty cent Canadian airline ticket tax would raise roughly \$10 million per year for the program.

Administration of the small and isolated community subsidy program should be by the CTC rather than by Transport Canada in an attempt to partially isolate subsidy awards from political forces. Should a community receive a subsidy, the amount of subsidy will, in general, be subject to an annual renewal. The CTC at its own discretion, however, may elect to enter into contracts with subsidized carriers on a two or three year basis, if it feels that such longer contracts will result in a greater or more stable level of service. The CTC may of course determine that no subsidy is necessary. For example, if the community receives scheduled public transport from another mode, such as Via Rail, or if another air carrier is serving the market at an acceptable level of service without subsidization, then no subsidy should be awarded. Only communities receiving scheduled service on the day that the advanced liberalization policy is tabled should be eligible for the program. For communities with alternative year round modes of transportation, subsidization will be limited to seven years. The subsidy program can continue indefinitely for communities for which air transport is the only viable year round transport link.

A final aspect of the advanced liberalization policy is a statement as to what constitutes predatory behaviour in airline markets. Traditional anticompetitive definitions are more applicable to goods industries where products can be stored, or to industries where services can be withheld. In the case of airlines, where once a plane is flown services are provided which cannot be stored for future sale, there are many concepts as to what constitutes the marginal costs to be used in determining if fares are compensatory. We believe that waiting for government agencies or the courts to rule on specific abuse cases could result in at least short term ambiguity and therefore abuses in the market.

New Zealand, in its recent deregulation law, adopted an interesting approach in describing predatory behaviour. While leaving specifics to the appropriate government authority, its new deregulation law gives examples to serve as guidelines. For example, Section 29 of the 1983 Air Services Licensing Act states:

If a dominant licensee significantly lowers his price for an air service below his price level or below his prices for equivalent services elsewhere thereby driving out competition in a particular market, and then raises his price to his original level, ASLA (Air Services Licensing Authority) may subject him to a review under this clause. On the other hand, if a dominant licensee merely lowers his price in response to competition in a way that is reasonable having regard to the behaviour of the competitor, he is not likely to be subjected to a review.

The choice of words in this section of the law still leaves ample opportunity for judicious interpretation by the ASLA while giving carriers a statement before the new law takes effect as to the type of behaviour

that will not be allowed. Note also the use of the word "dominant." The Act specifies various penalties for inappropriate behaviour.

Policy Four: Complete Deregulation

The final regulatory policy is complete deregulation. Here carriers have unlimited freedom to enter and exit markets and unlimited freedom to raise and lower fares. To achieve this, legislation is required to remove the public convenience and necessity criterion of the Aeronautics Act. In its place one would propose a fit, willing and able criterion as in the United States or perhaps, better yet, a qualitative regulation criterion as used in New Zealand. (See chapter 7 for a description of qualitative regulation.) The latter emphasizes the overall fitness of a carrier to conduct air operations. This includes not only safety considerations but financial considerations as well. Carriers would be continually monitored to ensure that they maintain high safety standards and financial qualifications.

Complete deregulation is characterized by the following points:

- replacement of "public convenience and necessity" with a "fit, willing and able" criterion in awards of licenses;
- continue regulation "into the industry" (as opposed to "onto" routes) using the "fit, willing and able" criterion;
- no regulation of entry or exit from routes;
- no regulation of fare increases or decreases;
- no regulations on conditions of service such as number of stops, frequency of service, aircraft type, or capacity;

- no North/South distinction;
- small and isolated community subsidy program;
- introduction of an airline employee dislocation retraining program;
- a statement of what constitutes predatory behaviour in a market, a mechanism for enforcement and provision of effective penalties to defer such behaviour;
- a public information program concerning buying ticket insurance in case of carrier bankruptcy.

The complete deregulation policy removes all economic constraints on carriers' choices and performance in air transport markets in Canada. The small and isolated community subsidy program is retained, recognizing that Canada will continue to have a goal of maintaining service, possibly unprofitable, to such communities.

Under complete deregulation one would expect greater entry into the industry by totally new carriers. Many of these carriers may operate with significantly lower wage rates and fewer work rule restrictions than incumbent carriers. Incumbent carriers will thus be hard pressed to lower their cost structures in order to meet the competition from the new entrants. This may result in significant concessions by airline labour to airline management. Should such concessions occur this would indicate that airline labour in the past (under the regulated regime) had been collecting economic rents. It is irrelevant to debate whether the collection of these rents in the past was proper or not. What is relevant now is that a transfer of income is taking place from airline labour to others. Evidence from the United States suggests that capital does not achieve higher profit

levels in a deregulated environment. Thus, the gainers from deregulation are the airline consumers.

The great flaw of market economics is its inability to address the issue of income distribution. Correspondingly, market oriented economic policies can be criticized by their failure to address the income redistribution consequences of their actions. In our view, a move to complete deregulation will likely result in a transfer of income and wealth from labour to the airline consumer. Most market economists justify projects, such as economic deregulation, using the potential Pareto criterion. This social welfare theorem states that a project is worthwhile if the gainers from a project could potentially compensate the losers. In the airline context this means that the gains to airline consumers are greater than the losses born by airline labour. The flaw of such decision-making is its failure to provide for a mechanism to transfer resources from the gainers to the losers. We believe that a fair and politically viable economic policy proposal in Canada will include a mechanism for such transfers. Accordingly, we provide such a mechanism through the airline employee dislocation and retraining program.

The intent of this program is to ease the transition of airline labour to the completely deregulated environment, while still providing carriers incentives to make optimal use of the economy's scarce resources.

The mechanism of such a program need not be specified here. However, to illustrate the concept we have in mind, we outline the form such a program could possibly take. Since the gainers from deregulation are airline consumers one might propose a two dollar ticket tax on every ticket sold in Canada for a period of three years.² The proceeds of this tax will go to a

fund administered by the CTC. Individuals who are employees of the airlines prior to the tabling of the deregulation policy will be eligible for benefits. Those who become employees after tabling will be ineligible. Any airline employees losing his/her job (other than for cause) is eligible for up to 12 thousand dollars in benefits. These benefits are only to be used for relocation expenses (in the case of employees being terminated at stations closed by an airline) or for retraining or education expenses. These are benefits over and above existing unemployment compensation, and retraining benefits. This program will provide employees with the resources necessary to relocate and if necessary to "retool" themselves into other industries. Unlike the case of the employee protection program in the U.S., we propose that the CTC does not need to determine whether or not deregulation was the reason for layoffs.

A final aspect of deregulation concerns carrier bankruptcy. Since PCN is no longer used for entry and exit, carrier profits have no protection. As in any unregulated industry, inefficient firms and firms which incorrectly perceive market demands can be expected to go bankrupt. In most industries, this is a matter for stockholders to deal with. They must choose a management team who will look after their interests in the deregulated environment.

Some may argue that air transport will continue to have an important public interest. This is due to the fact that it was once regulated (consumers may need time to adjust and acquire information), because of its vital role in national communications, and because a large proportion of the industry's customers prepay for services. In the U.S., the bankruptcy of Braniff resulted in near normal traffic flows within a few days. Other

carriers stepped in with their excess capacity. The main consequence was that several passengers had prepaid tickets which now could no longer be used. The majority of these were served at no cost by other carriers. A few were left with worthless tickets.

The bankruptcy issue also has an important dynamic element. If rumors circulate that a carrier is having financial difficulties, travel agents, seeking to protect their own prepayments with air carriers, may stop issuing tickets on the threatened carrier, thereby insuring its demise. There are many solutions one can think of for this problem. One which appeals to us is to inform both the public and travel agents (during the early transition to deregulation) of the existence of third party ticket insurance programs at modest fees. Concerned consumers or agents could purchase such insurance if they choose. Carriers, of course, could opt to purchase the insurance on the consumers behalf as part of the ticket price.

C. Alternative Policies With Respect to Air Canada

In the previous section we outlined four policies the government could pursue toward general regulation of air transport. In this section we similarly outline alternative policies the government might pursue with respect to the Federal Crown carrier, Air Canada.

Alternate A: Pre May 10, 1984 Air Canada Policy. Air Canada is 100% federally owned. The carrier has reasonable access to public funds without achieving a rigorous private sector investment test. The carrier is expected to establish and provide a service standard for all of Canada.

Alternate B: Pre May 10, 1984 Air Canada Policy. The carrier must achieve a private sector test for access to additional public funds. The carrier is constrained somewhat in its ability to initiate competitive moves in domestic markets. Federal government ownership of 100% of Air Canada continues.

Alternate C: Privatization Without Breakup - Under this policy Air Canada is sold to the private sector in entirety. There is no breakup of Air Canada. None of its divisions are spun off. None of its routes are spun off.

There are four different methods for selling Air Canada. The first of these is sale of Air Canada to the highest bidder. This, for example, is the approach apparently being taken in the U.S. in its privatization of Conrail. Under this alternative, Air Canada is most likely to be sold to a single entity (we assume it will not be sold to another airline). The new owner is likely to exercise complete control over Air Canada. Because of this we speculate that Air Canada would rapidly become a very effective competitor especially in a deregulated environment.

A second method for the sale of Air Canada would be a general sale or placement of stock. This, for example, is the method used for the recent sale of British Telecom. It is also the method that was used for the sale of Pacific Western Airlines in late 1983. Under this scenario the ownership of Air Canada is likely to be dispersed among a fairly large number of investors. In this case it is not assured that the new owners of Air Canada will exercise effective control over the carrier.

A third method for the sale of Air Canada would be to give a share of Air Canada to all Canadians. This was the method used for the privatiza-

tion of the Crown Corporation in British Columbia known as B.C. Resources. A major problem with this option is that it actually can aggravate Air Canada's dominance of the domestic market. When Canadians are faced with choosing between Air Canada and a competitive carrier, both offering the same fare and service levels, they may be inclined to choose to fly on "their" airline, Air Canada. Since one of the alleged major problems with Air Canada in the current air transport environment is its dominance of the domestic market, we believe that this alternative should not be considered.

A fourth alternative for the privatization of Air Canada is to sell shares to the company's employees. Air Canada's management has actually recommended this option, at least in part. The management of Conrail in the U.S. has also advocated this in its privatization. There is quite a bit of precedent for the sale of company stock to employees. Several airlines in the United States have sold stock to their employees as a means to provide productivity incentives and to achieve wage and work rule concessions from labour. Examples are Eastern Airlines and Pan American. Some of the new upstart airlines in the United States also have employee stock ownership. People Express requires a substantial ownership of its stock before one can become an employee of the airline.

It has been suggested that employee ownership of an air carrier can be a very effective means to achieve efficiency gains. Employees identify with the activities of the company and management's goals and then strive to achieve excellence. In such an environment it is perhaps easier to obtain necessary work rule concessions. Furthermore, in many other high technology industries, such as electronics and computers, companies have

substantial employee participation in the ownership of the company. It has been suggested that this leads to a stable work force and a highly motivated group of employees.

One major problem with sale of stock to employees is that such proposals often have at their core a share price significantly below the worth of the company. Further, in some proposals, such as the employee takeover of Conrail, employee ownership groups typically will pledge significant portions of the assets of the company as collateral to obtain the funds to purchase the stock. This can leave the carrier with a very high debt to equity ratio, which in turn could adversely affect operations and planning for many years. This study is concerned with the structure of the industry. Thus we are not concerned with the price paid for Air Canada. We do have a concern if the method of privatization cripples the ability of the company to compete in its markets; unless the policy under consideration would prefer to intentionally cripple the dominant air carrier during the period when the industry moves to deregulation.

A final method for privatization of the Crown air carrier involves various combinations of the above. In our opinion, of the above four methods, the first, sale to the highest single bidder, and the fourth, sale of assets to employees, have attractive merits. We believe both of these methods offer greater potential for achieving efficiency gains. In the case of sale to the highest bidder, stockholders exercise effective control over the carrier and can quickly redirect its policy, if necessary. In the case of sale to employees, one is likely to obtain a very cooperative attitude with the work force in order to achieve gains such as innovation and changes in currently restrictive work rules.

We feel the alternative of giving a share of Air Canada to all Canadians is very undesirable, given the undesirable impact this would have on the dominance of Air Canada in domestic markets. A general placement of Air Canada stock to a wide group of investors would not increase the carrier's dominance, but it may be some time, if ever, before stockholders can take effective control of the carrier from management. A combination, such as a partial sale of stock to employees with the balance being placed with the highest bidder, seems attractive. In the absence of historical evidence, it is difficult to make definitive statements on the impacts various methods of privatization will have on the performance of the carrier. In the analysis in the chapters which follow we assume that in Policy C, privatization of Air Canada, stockholders have been able to gain effective control of the carrier from management and can redirect the carrier if they so choose.

Alternate D: Privatization With Breakup - Under this policy, we consider a dismemberment of the carrier into one or more pieces. Each of the pieces in turn is sold to the private sector.

Reasons for Breakup

In a 1984 article in the Yale Journal on Regulation, Elizabeth Bailey and John Panzar examined the effect of competition in U.S. airline markets since deregulation. Using evidence obtained from the United States Civil Aeronautics Board, they find that markets with actual competition achieved greater gains from deregulation than markets without competition. This is in contrast with the economic theory of contestable markets which suggests

that actual competition in markets is not necessary. According to the theory the threat of competition is sufficient to cause an incumbent carrier to behave in an economically efficient manner. While Bailey and Panzar do not refute this claim, they do indicate that the presence of actual competition in the market was far more effective (in the early U.S. experience) in lowering fares and increasing service offerings.

The major concern with respect to Air Canada in Canadian air transport regulatory policy is the effect its dominance of the market would have on the performance of a deregulated airline industry. Air Canada currently has 60% share of the domestic Canadian market. This large market share is a concern if it represents a substantial number of markets in which the carrier is a monopoly. It can also be a concern if it indicates that Air Canada has deeper financial pockets than its competitors and thus would be able to survive a long and protracted battle to achieve monopoly power.

Some observers of the Canadian airline industry suggest that Air Canada's dominance of the domestic market per se is no need for concern. Some will cite the contestable markets theory from economics claiming that the threat of entry into markets will force Air Canada to behave properly. Others, such as former Minister of Transport Lloyd Axworthy, suggest that Air Canada's relatively high cost structure will give it a disadvantage in markets. He claims that potential competitors could quickly drive Air Canada out from a market due to its high fares. This of course is premised on Air Canada not being able to draw on the Public Treasury to finance ongoing losses. It also assumes the airline is effectively prevented from engaging in predatory practices.

In our results below we find there is rather weak evidence that Air Canada's historical cost structure has been greater than that of other carriers. It has often been alleged that simple measures of Air Canada's productivity have been below those of CP Air. If one controls productivity for differences in operating environment, particularly after controlling for CP Air's long stage length, we find that Air Canada's productivity disadvantage is not as great as it seems. Furthermore, we show in subsequent chapters that if one also controls for the level of capital stock, almost all Canadian airlines have similar levels of productivity and similar cost structures. This would suggest that Mr. Axworthy's contention that Air Canada's costs are higher than others will not be borne out. Recent evidence, however, suggests that in the past year or two, CP Air and others may have been moving more quickly than Air Canada to lower cost structures. In particular, CP Air has been much more aggressive than Air Canada in reducing work forces and in asking labour for wage cutbacks and work rule concessions. This might suggest that in 1985 Air Canada does have a disadvantage in cost.³

Methods of Breakup

There are a number of different ways in which Air Canada could be broken up. We briefly consider some of the most commonly mentioned of these now.

One potential breakup that has been suggested is to divide Air Canada into a domestic airline and an international airline. (Perhaps one could call these Trans Canada Airlines and Air Canada, respectively.) While this would significantly reduce the size of Air Canada in an absolute sense,⁴ it

does little to reduce the dominance of Air Canada in domestic markets. The only way we could see any such effect is if there would be a greater tendency for passengers connecting from domestic flights to international flights to consider competitors to "Trans Canada Airlines" for the domestic leg.

In a study of international airlines, Tretheway (1984) has found that after controlling for stage length, load factor, and economies of scale, operations in international markets are slightly more expensive to serve than operations in domestic markets. One possible source of this difference is the higher amount of regulation in international markets. Carriers must contend with two governments on each international route, rather than just one. Further, there may be marketing disadvantages in establishing a presence for an air carrier in foreign countries.

There is casual evidence suggesting that there are some synergies (or as economists would say, economies of scope) between domestic and international operations. As an example we consider Pan American Airlines in the United States. Prior to U.S. Deregulation Pan Am operated essentially no domestic routes within the United States (other than a few routes from the West Coast to Hawaii). One of Pan Am's first moves in the deregulated U.S. environment was to open several domestic routes. It was also successful in obtaining control of a domestic carrier, National Airlines. Pan Am however, soon found that simply having a domestic route system did nothing to improve its overall position. It discovered that for a good synergy between domestic and international operations the domestic operations must feed the international operations. As a result, over the past several

years the former National Airlines network has essentially disappeared. Pan Am has transferred the employees and the airplanes to different domestic routes which better feed Pan Am's major international hubs in New York, Miami, Los Angeles and San Francisco. By careful planning of schedules and routes, Pan Am can carry international passengers for a much longer trip length. The passenger can now travel on the domestic system to the international gateway and from there overseas.

Trans World Airlines, another major U.S. air carrier, has claimed in recent years that its only profitable operations are in its international divisions. Nevertheless, it continues to maintain a strong domestic network because of the feed that it provides to its international services. As yet another example we observe that United Airlines a carrier which only had domestic operations prior to deregulation has started to operate routes to foreign countries as they become available.⁵

We observe many examples elsewhere in the world of countries with totally separate international and domestic air carriers. It is difficult to determine whether there are efficiencies from having this division as their domestic carriers operate in highly regulated environments and are not free to make choice of routes and traffic feed.

We feel that consideration of a domestic versus an international breakup of Air Canada affords little potential for reducing Air Canada's dominance in domestic markets. Since the major concern in considering the breakup of Air Canada is to reduce its domestic dominance we feel that such a policy would be fruitless.

Another potential breakup of Air Canada that has been proposed is to separate some of its support services from its operation side. For example,

it has been suggested that Air Canada's maintenance operations and perhaps its reservations systems be severed from the air carrier. Again, we see no potential for such a breakup to reduce Air Canada's domestic dominance of domestic passenger markets. In an interview conducted during the course of this research, Claude Taylor, Chairman of the Board of Air Canada, indicated that if Air Canada was forced to spin off its maintenance base, the first act he would do in a privatized environment would be to reacquire the maintenance base or an equivalent. Furthermore, since Air Canada's computer reservation system has a very high degree of unbiasedness we feel that severing this operation from Air Canada does not have much potential for reducing Air Canada's domestic dominance.⁶

A third alternative for a breakup of Air Canada would be to sever it in two: one piece consisting of transcontinental routes (perhaps including its international routes as well), and a second piece consisting of its regional routes in central and eastern Canada. This combination does afford some potential for reducing the absolute dominance of Air Canada in domestic markets. Such a breakup could reduce the share of the total Canadian domestic market to perhaps 30 or 40 percent for the larger segment. Such a division could preserve any synergies that might exist between transcontinental routes and international operations. However, if such a breakup were constructed so that the regional routes have no links between themselves, we feel that the regional carrier would not make very much sense in a network sense. One also wonders whether there are synergies between transcontinental and regional operations. If so, the transcontinental carrier may choose to develop its own regional network in a deregulated environment and thereby regain its market dominance.

A fourth alternative is perhaps a more intelligent variant of the previous alternatives. Here Air Canada would be broken into perhaps two or three pieces. Each of these smaller carriers would have a set of regional routes. For example, there could be an Air Canada Maritimes and a Central Air Canada. Each of these regional carriers in turn would receive rights and the necessary equipment and personnel to operate in transcontinental markets. This would give each of the regional carriers an intelligent route structure in the sense that the regional carrier would be able to gather feed and take it on the long hauls. The two (or three) carriers would compete with each other and with CP Air and Wardair on transcontinental routes. Each of the new regional carriers would also be in competition with one or more of the existing regional carriers. This break up seems to offer the greatest potential for reducing the dominance of Air Canada. It would also be consistent with the findings of Bailey and Panzar that when one has competition in markets, economic efficiency is improved.

In closing this section on potential breakups of Air Canada, we observe that there are in fact very few routes on which Air Canada enjoys a true monopoly. If one is concerned only with the monopoly power of the carrier in specific domestic markets (rather than the size of the carrier per se) then a breakup of Air Canada might be unnecessary. Perhaps a more effective solution would be to selectively spin off Air Canada's monopoly routes to existing or new air carriers. For example, Air Canada currently enjoys what some claim is a monopoly of service in Saskatchewan. The Saskatchewan routes and corresponding equipment and personnel could be transferred to an existing air carrier or perhaps offered to a set of em-

ployees (or others) to form a new airline. This of course simply transfers the monopoly on the Saskatchewan routes from a large carrier, Air Canada, to a smaller air carrier. To alleviate this Air Canada could be given the option to reenter the routes (perhaps with a nine month lag) in competition with the carrier who had received the original award of the routes.

A variant of this was recently undertaken by the U.K. with respect to British Airways. After a lengthy review of air transport policy, the British decided to keep British Airways intact as a dominant air carrier. However prior to doing this they chose to transfer some routes between British Airways and a private competitor, British Caledonian. British Caledonian received British Airways' profitable routes in the Middle East. British Airways acquired some unprofitable South American routes of British Caledonian. The intent of this was to strengthen British Airways' main competitor, British Caledonian, prior to privatization of British Airways. Here in Canada, one might consider selective spinning off of profitable Air Canada routes to competitors to strengthen them in order to survive in a deregulated environment with a privatized Air Canada.

In the analysis which follows in the chapters ahead, we define policy Alternate D, privatization and breakup, as consisting of a breakup of Air Canada into two or more regional carriers each with transcontinental routes. We believe this is the logical method of breaking up Air Canada if the goal of the breakup is to reduce the dominance of Air Canada in domestic markets.

A policy which one could contemplate, but which we do not analyze here, would consist of a breakup of Air Canada without privatization. The

Federal Government would thus have two (or more) crown airlines competing with each other. We know of no precedent for Federal Crown Corporations competing with each other in a fundamental way and therefore do not consider this policy any further.

Notes to Chapter 1

1. Note that the accounting costs may indicate profits in a certain market when actually economic costs exceed the fares collected. Further, even if fares cover economic costs the contribution margin derived from short haul routes do not adequately reflect the less elastic nature of demand for short haul routes relative to long haul routes.
2. With roughly 20 million passengers per year, this will raise \$120 million. This will provide \$12,000 for 10,000 employees, roughly 25% of the existing airline labour force.
3. Data for 1982 to the present have not been published and are considered confidential by the government.
4. ICAO reports that in 1983 Air Canada carried 7.1million passengers in domestic service versus 3.3 million in intercontinental services (including transborder). CP Air carried 2.3 million domestic passengers and 1.3 million intercontinental passengers.
5. United has also requested government approval of a plan to acquire Pan Am's Pacific authorities for a cash payment by United to Pan Am.
6. There may be other considerations that would favor separating the reservation system from the carrier. The potential of the system for quickly amassing data on competitors is one of these. The system also controls the flow of information from the carrier and its competitors to their primary customers, travel agents.

PART II - ANALYSIS: DATA, TECHNIQUES AND RESULTS

Part II consists of (4) a description of the data base and a review of trends in the industry, (5) cost and productivity analysis, (6) the demand for airline services, (7) discussions of the U.S. and Chilean deregulation experiences, (8) simulation of costs under alternative policies, and (9) simulation of price and service offerings.

Chapter 4: The Data Base and Industry Trends

A. The Canadian Data Base

The measurement of total factor productivity and estimation of cost functions require data on prices and quantities of outputs, attributes of each output, network variables, and prices and quantities of inputs. We created an annual data base of the seven transcontinental and regional carriers for the following years:

1964-81: Air Canada, CP Air, FWA, Quebecair, EPA

1964-79: Transair (merged with FWA in 1980)

1971-81: Nordair (incomplete data for prior years).

1981 is the most recent year for which complete data was available.

Our data base for cost and productivity measurement consists of the variables listed below.¹

Outputs (physical quantities and revenues)

Scheduled Passenger Service
Scheduled Freight Service
Charter Services

Inputs (physical quantities and costs)

Labour (6 categories)
Flight Equipment
Ground Property and Equipment (7 types)
Fuel
Other Inputs (referred to as "materials")

Network and Operational Measures

Stage Length (average distance between takeoff and landing)
Load Factor (% seats sold)
Number of Points Served
Seats per Aircraft

At the time we began this research, separate output data were not available for domestic, transborder and international routes. Therefore, we disaggregated total output into three categories: scheduled passenger services (Y_1), scheduled freight services (Y_2), and charter services (Y_3). The pure network measure we considered is the number of points served by the carrier.

We aggregate inputs into three categories: labour (L), fuel (F), and capital and materials (KM). Labour input (price and quantity) was measured by a multilateral index (Caves, Christensen and Diewert, 1982) of six sub-categories of labour: pilots and co-pilots, other flight personnel, maintenance labour, aircraft and traffic servicing, general management, and other employees. The four fuel types (turbo fuel, aviation gasoline, turbo oil and other oil) were converted into a common measure, the British Thermal Unit (BTU), to create aggregate fuel input (price and quantity).

For each of the eight categories of capital inputs, we created a real capital stock series using the perpetual inventory method. The opportunity cost of using a dollar's worth of the asset was computed utilizing the capital service price method proposed by Christensen and Jorgenson (1969), modified to reflect Canadian tax laws. This method takes into account the effects on user cost (of a capital asset) of changes in corporate income tax rates, capital cost allowances, investment tax credits, capital gains (or losses) due to changes in the asset price, property tax rates as well as interest and depreciation.

"Materials" input is a catch-all category which includes all other purchased inputs. The GNE deflator is used as a proxy for the price of the materials input. Since we did not have access to the data on carriers'

rental payments of flight equipment, we were not able to include it as a part of the capital costs computed above. Instead, because of the way we compute the cost of materials inputs, the rental payments on flight equipment are captured in the materials category. Therefore, in order to avoid the potential bias in our input data, we aggregated materials with the eight categories of capital inputs to create an aggregate multilateral index for capital and materials.

B. Review of Industry Trends

The current size and structure of the airline industry in Canada has resulted from regulatory policy and decisions as well as from the domestic and international economic climates. In order to understand the issues raised in Chapter 1 as well as assess the results of the analytical models, we subsequently estimate, a review of industry trends and descriptive statistics is useful. Trends and directions of carriers provide a perspective for assessing the past and prescribing the future.

B.1 Growth Trends of the Carriers

Figures 4-1 and 4-2 illustrate the total revenue-tonne-kilometers (RTK) for the transcontinental and regional carriers. Total number of employees are graphed in Figures 4-3 and 4-4. In general, both output and number of employees indicate a rapid growth of all seven carriers over the study period included in our data set. Quebecair and Nordair are exceptions to this trend. Quebecair's output (and to a less extent employees) has been dramatically curtailed since 1978. Nordair's output has also been significantly reduced since 1979. In general, the output growth rates for

FIGURE 4-1
TOTAL REVENUE-TONNE-KILOMETERS
1964-1981

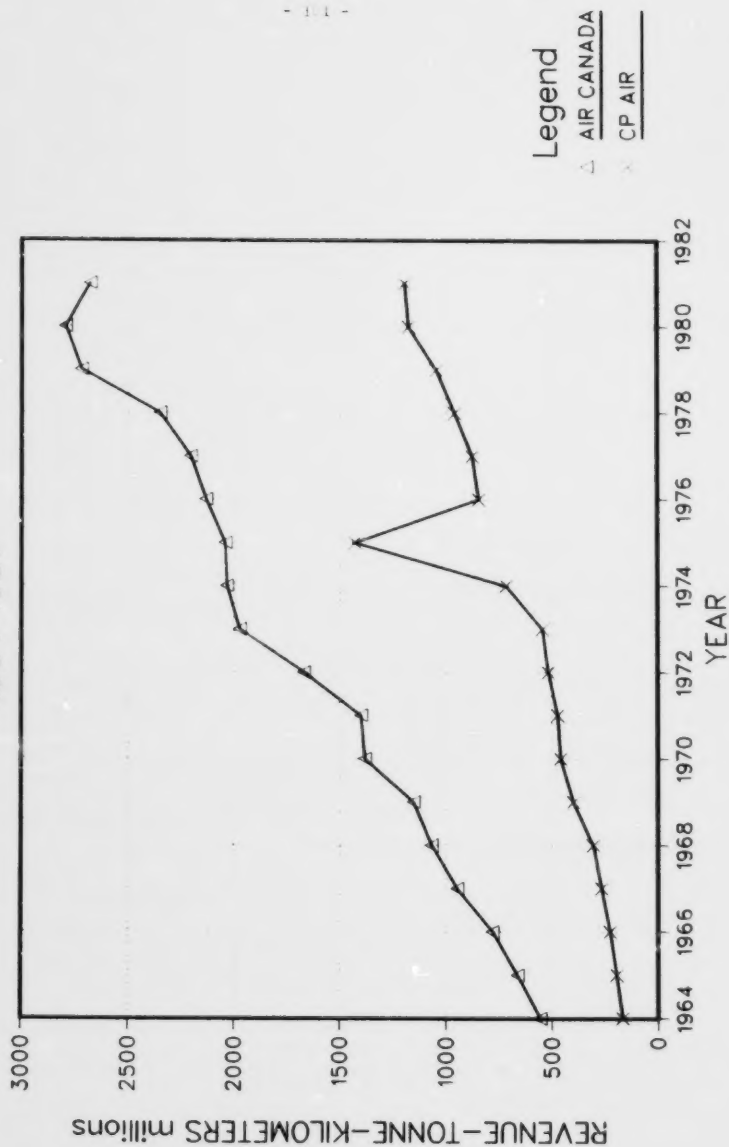


FIGURE 4-2
TOTAL REVENUE-TONNE-KILOMETERS
1964-1981

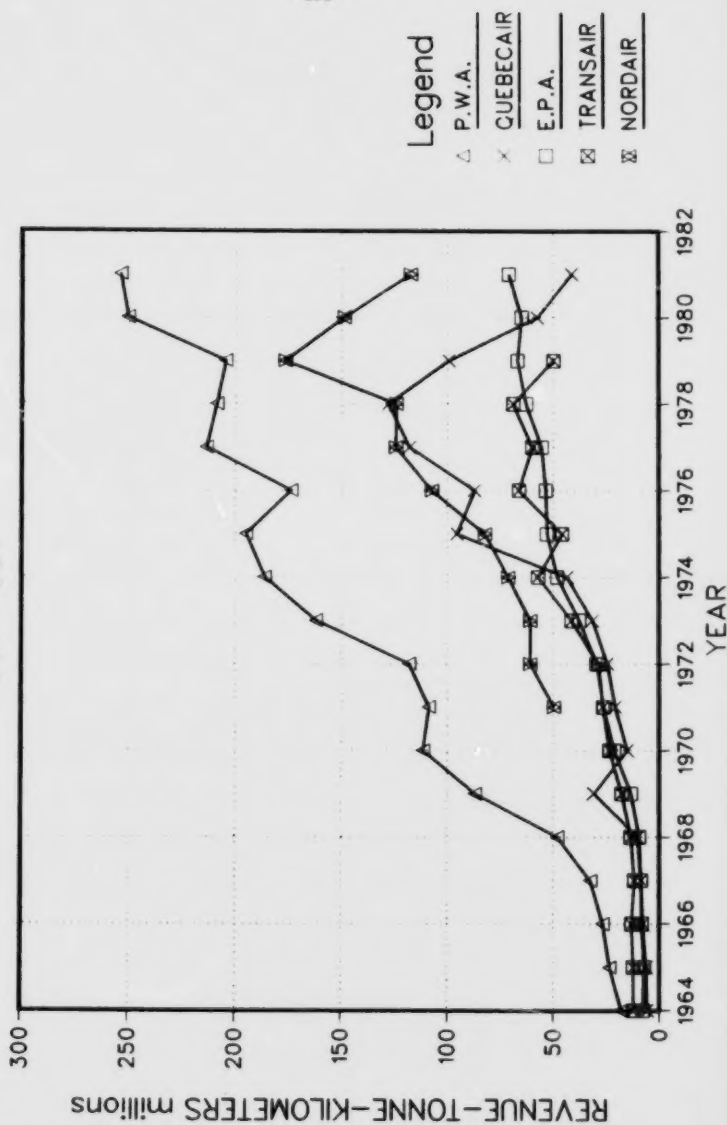
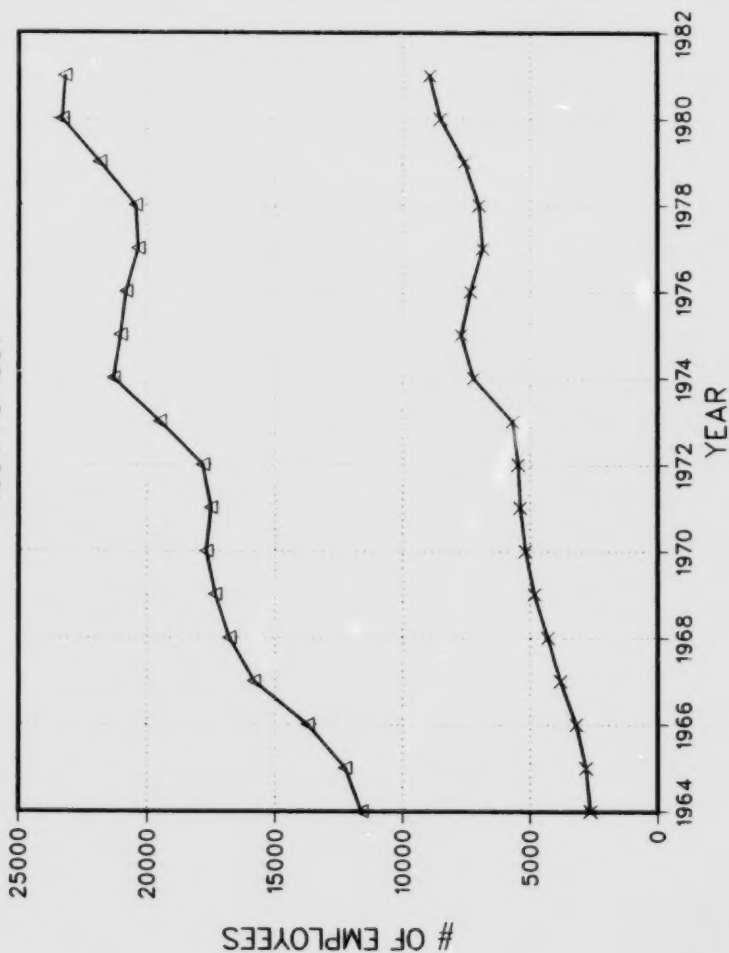
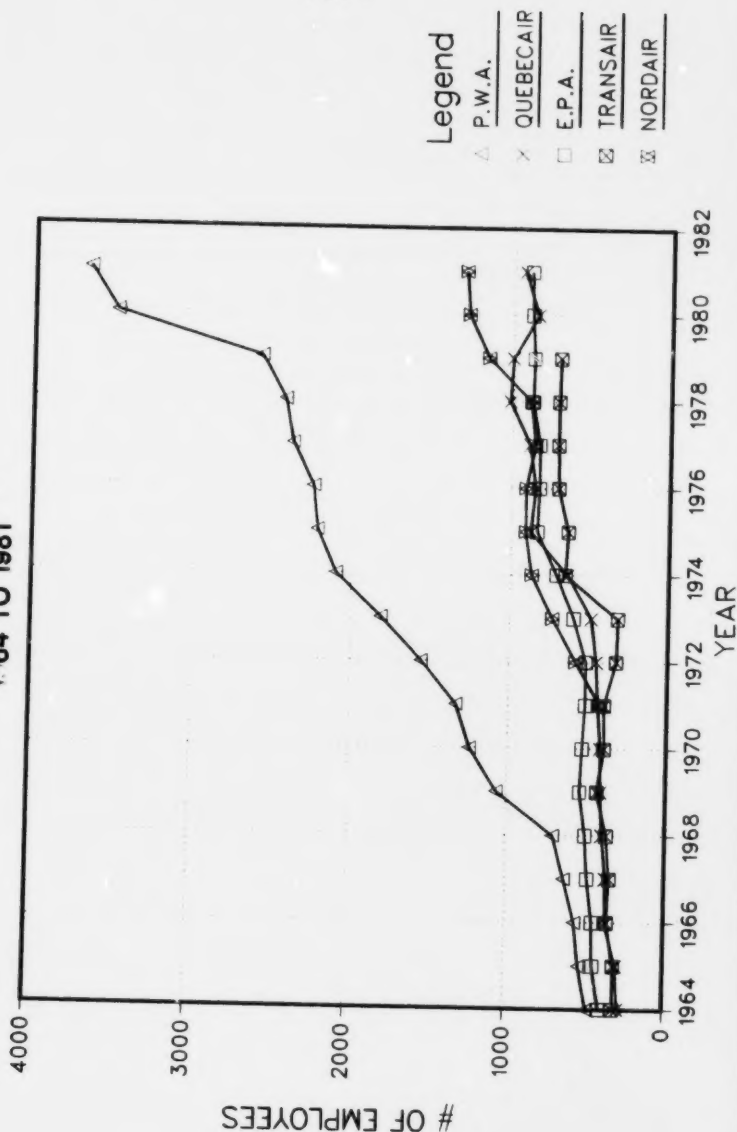


FIGURE 4-3
TOTAL NUMBER OF EMPLOYEES
TRANSCONTINENTAL CARRIERS
1964 TO 1981



Legend
△ AIR CANADA
× CP AIR

FIGURE 4-4
TOTAL NUMBER OF EMPLOYEES
REGIONAL CARRIERS
1964 TO 1981



the regional carriers have been higher than those of the transcontinental carriers. In particular, PWA's 1981 output is over eleven times that of 1964, and the number of employees grew from about 500 to about 3,700 during the same period. All other carriers except Quebecair and Nordair have enjoyed steady growth in both output and number of employees, at least until the recession of the early 1980's.

B.2 Changes in Output Mix

Figures 4-5, 4-6 and 4-7 indicate how the shares of scheduled passenger, freight and charter services outputs (in terms of revenue-tonne-kilometers) have changed for each carrier over the study period. Several observations can be made from these graphs:

1. Air Canada and CP Air have been heavily oriented toward scheduled services throughout the study period.²
2. Except for EPA, all regional carriers are substantially charter-oriented. Since 1978, the regionals have been reducing their reliance on charter services.
3. In 1964, EPA produced in excess of 50% of its total output in the charter and freight services market. Since then, EPA has focused its energy on developing scheduled services. Via equipment changes, route expansion and route trades with Air Canada, they had by the end of the 1970's the highest relative proportion of schedule passenger services of all regional air carriers.
4. Quebecair was heavily dependent on scheduled passenger service in 1964. However, it became the most charter-oriented carrier by the mid-1970s. Since 1978 it has attempted to reduce its dependence on charter services.
5. In recent years, Air Canada, CP Air and Nordair have had the highest shares of scheduled freight output relative to other carriers.

B.3 Input Prices and Quantities

The average annual compensation per employee is illustrated in Figure

- 4-8. Over the entire period, Air Canada's average salary was highest

FIGURE 4-5
SCHEDULED PASSENGER SERVICE
PERCENTAGE OF REVENUE-TONNE-KILOMETERS
1964-1981

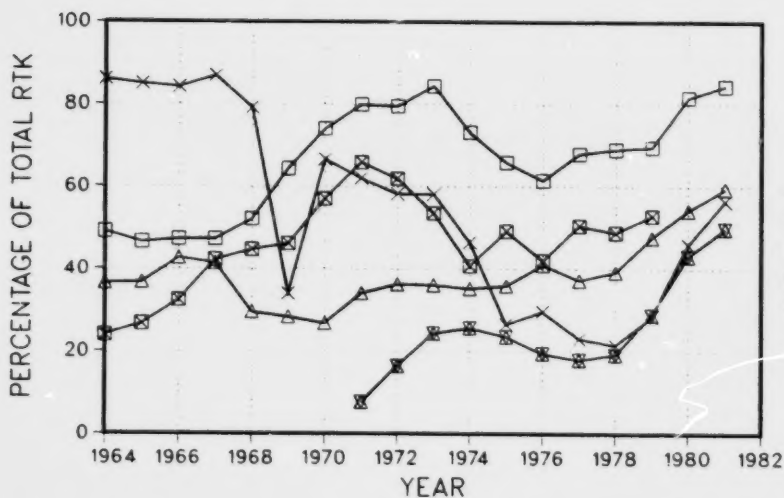
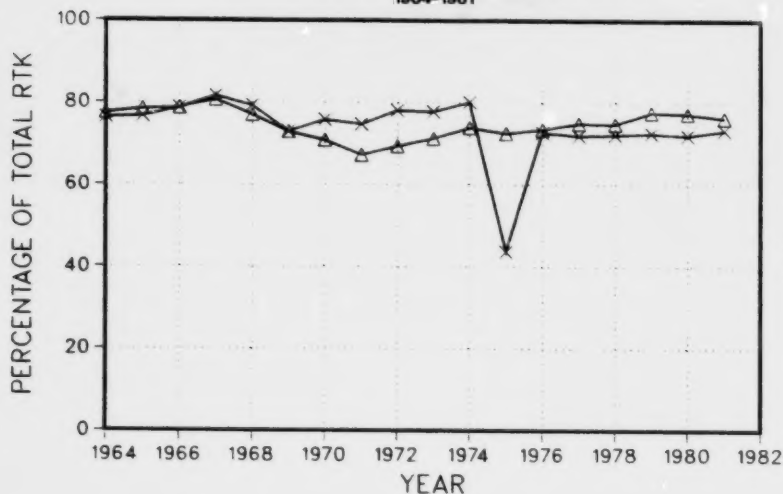


FIGURE 4-6
SCHEDULED FREIGHT SERVICE
PERCENTAGE OF REVENUE-TONNE-KILOMETERS
1964-1981

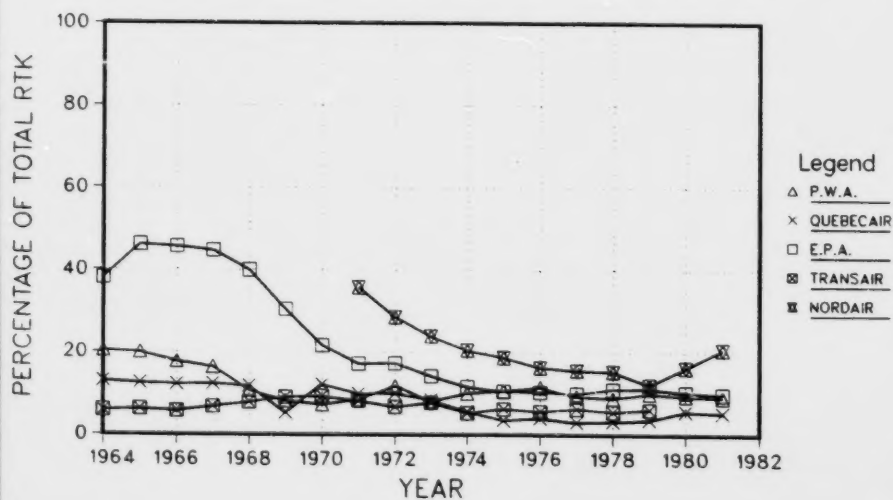
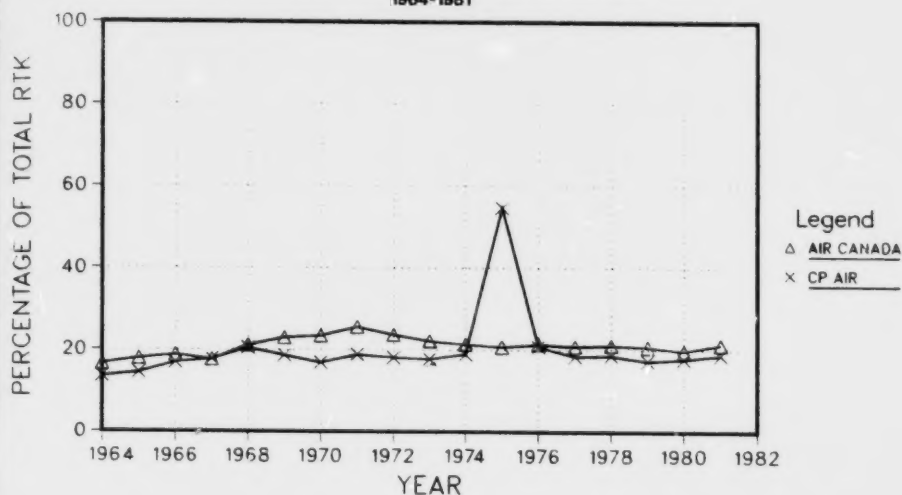


FIGURE 4-7
CHARTER SERVICE PERCENTAGE
OF REVENUE-TONNE-KILOMETERS
1964-1981

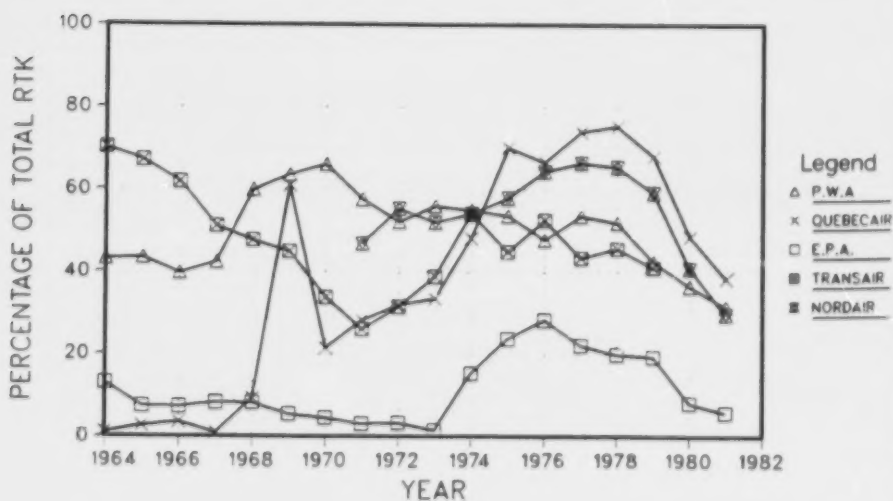
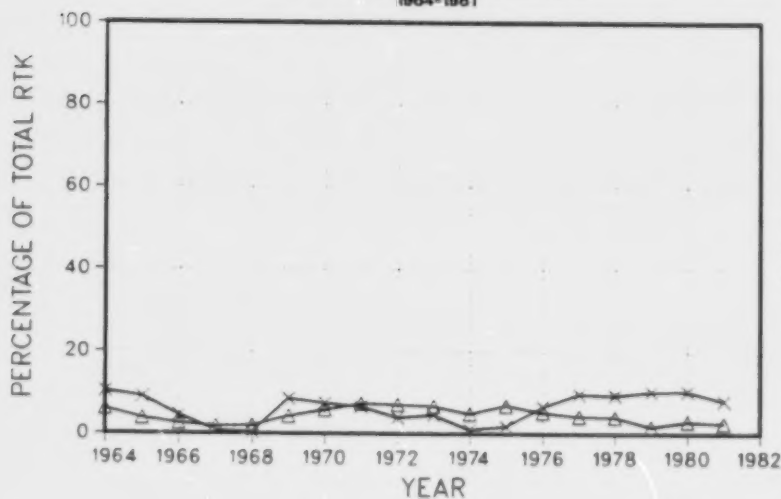
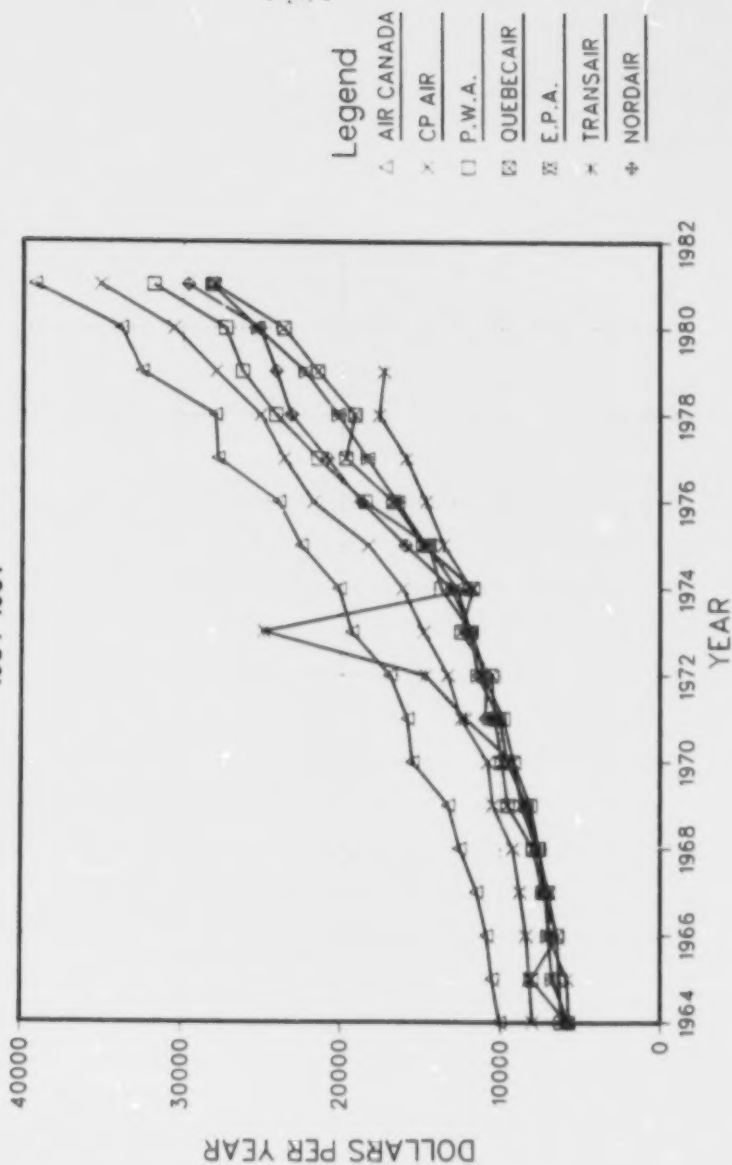


FIGURE 4-8
AVERAGE COMPENSATION
OVER ALL LABOUR CATEGORIES
1964-1981

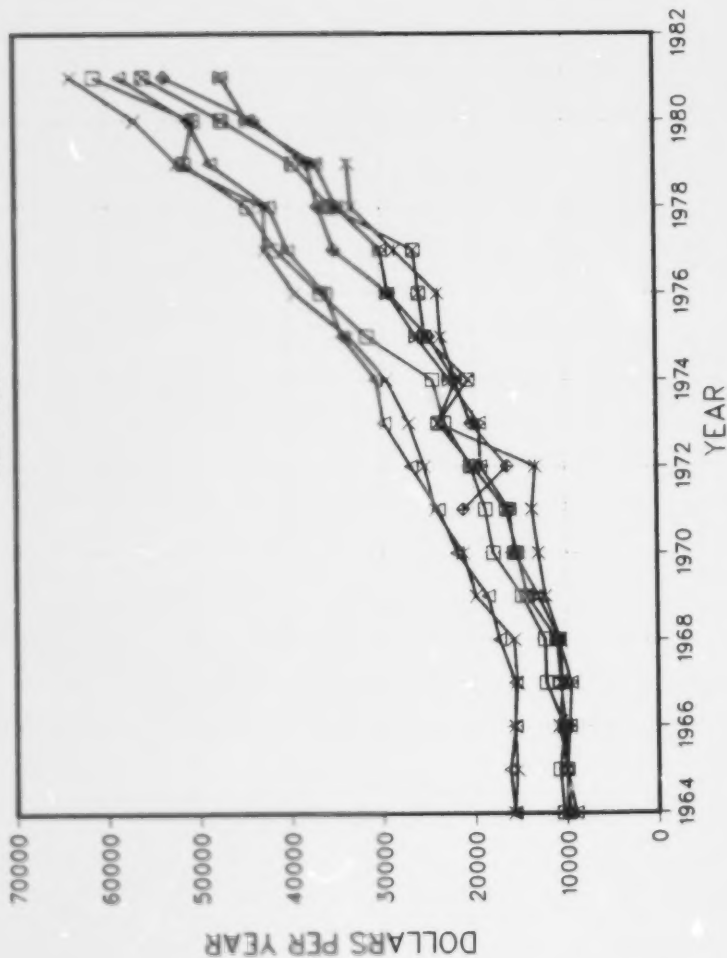


followed by CP Air's. PWA's average salary has been the third highest since 1977. There are indications of erratic behaviour in the case of Transair's average salary from 1972 to 1974. The reason is that Transair was undergoing a massive transition from small piston aircraft to modern jet equipment.

Figures 4-9 and 4-10 show the average compensation paid to pilots and co-pilots, and to general management. PWA's average compensation for pilots and co-pilots was somewhat lower than Air Canada and CP Air until about 1974.³ With the exception of the transitional period 1971-73 for Transair, Air Canada maintained an average salary for general management about \$10,000 to \$20,000 higher than that of CP Air. It is also noticeable that the average salary of general management for PWA has been among the lowest of all carriers. (We note that carriers have different practices in determining whether or not to classify an employee in the general management category).

Figure 4-11 shows the price per gallon of turbo fuel paid by each of the seven airlines. We observe some variation across carriers because of the difference in the geographical location of their routes. Fuel prices increased dramatically between 1973 and 1974, followed by an upward trend until 1979. Another large increase occurred between 1979 and 1981. Indices of fuel quantities consumed are reported in Figure 4-12 and 4-13. Illustrate that Air Canada was able to reduce its fuel consumption by about 20% between 1975 and 1978 while expanding its output (see Figure 4-1). During the same period, CP Air's fuel consumption did not noticeably vary while it too expanded output.

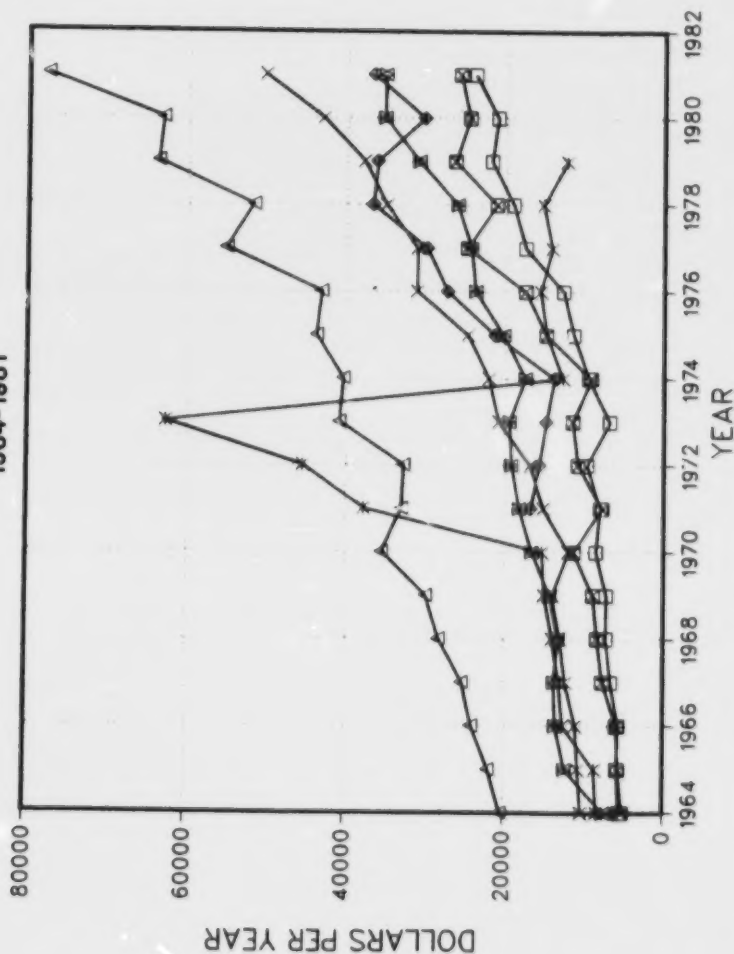
FIGURE 4-9
PILOTS AND CO-PILOTS
SALARIES
1964-1981



Legend

- △ AIR CANADA
- × CP AIR
- P.W.A.
- ▣ QUEBECAIR
- ▤ E.P.A.
- ★ TRANSAIR
- ⊕ NORDAIR

FIGURE 4-10
GENERAL MANAGEMENT
SALARIES
1964-1981



Legend

AIR CANADA

× CP AIR

☐ P.W.A.

019 J38310 2

— 30 —

100

100

FIGURE 4-11
PRICE OF TURBO FUEL
1964-1981

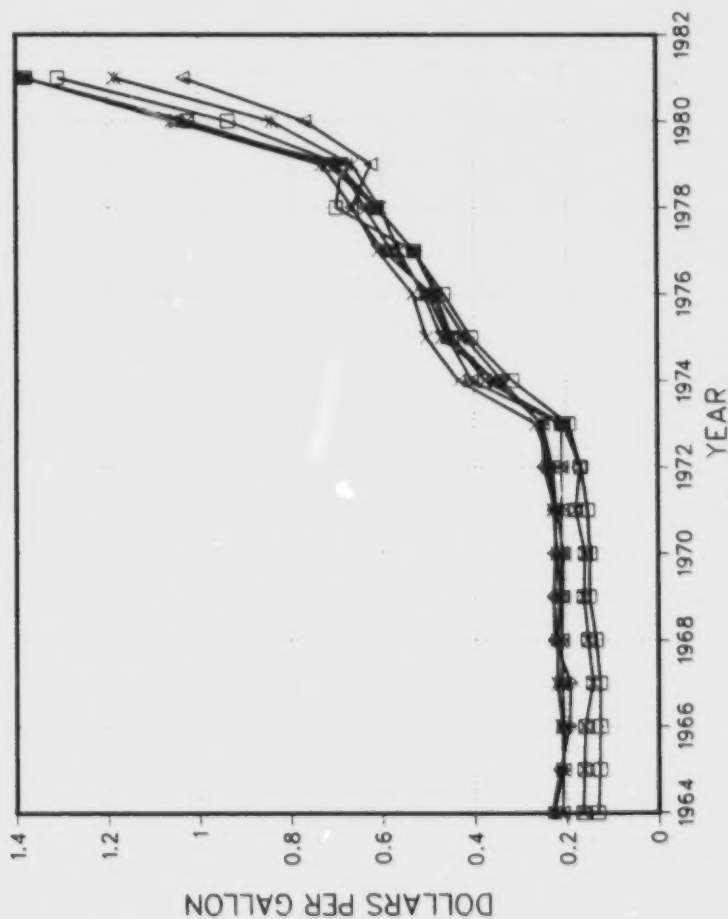
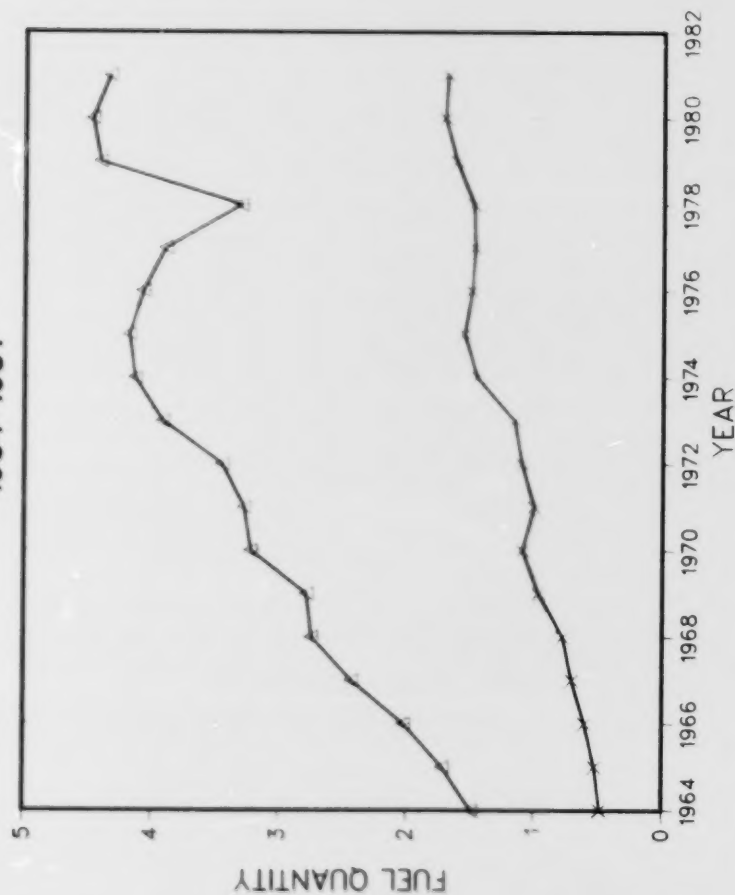
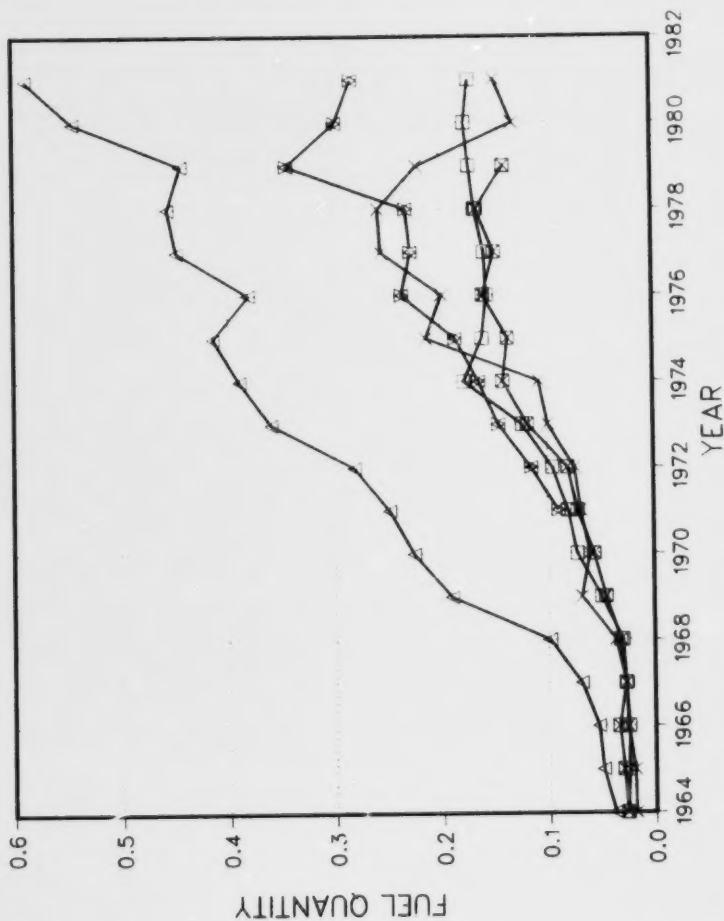


FIGURE 4-12
FUEL CONSUMPTION INDEX
1964-1981



Legend
△ AIR CANADA
× CP AIR

FIGURE 4-13
FUEL CONSUMPTION INDEX
1964-1981



B.4 Output Attributes and the Network

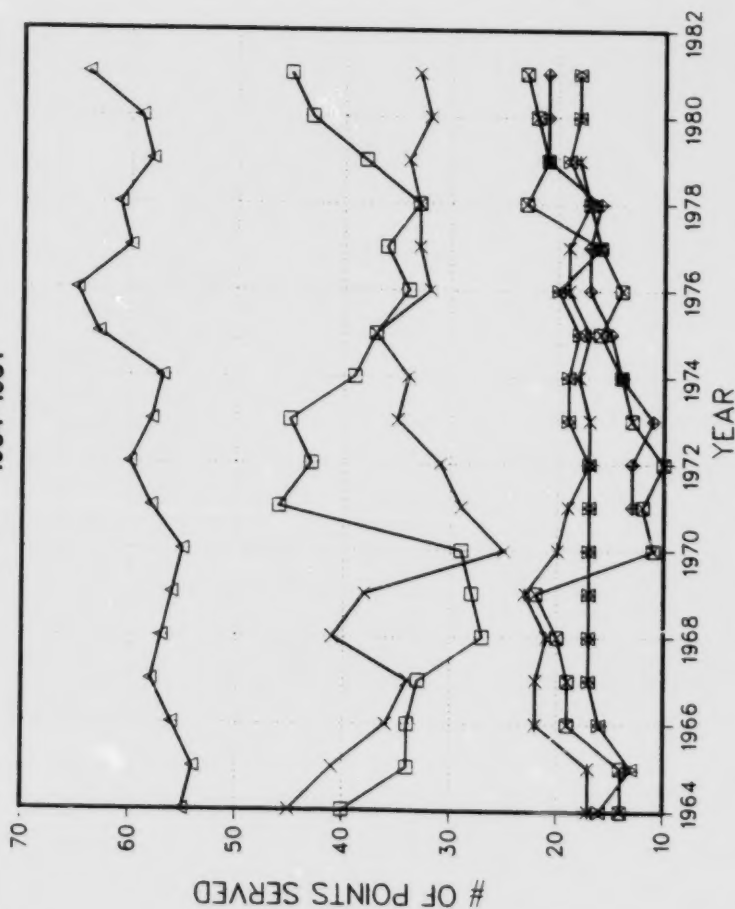
Figure 4-14 through 4-17 are, respectively, plots of number of points served, average load factor, average stage length, and weighted average number of seats per aircraft for scheduled passenger service.⁴ These plots indicate, among other things, the following:

1. Both Air Canada and CP Air have primarily long-haul and high density route networks relative to the regional carriers. Although there are some fluctuations over time, there is a consistent trend that the number of points served by Air Canada has increased from 54 airports in 1965 to 64 airports in 1981, while CP Air reduced its points served from 45 in 1964 to about 32 airports in the mid-1970s. CP Air has by far the highest average stage length and the largest average size of aircraft.
2. Among the regional carriers, Nordair has the longest average stage length followed by Transair (until merged with PWA). Quebecair has the shortest stage length. PWA and EPA have similar average stage lengths and utilize similar sized aircraft for their scheduled passenger services.
3. From 1968 to 1970, PWA dropped many of its scheduled points as it increased its emphasis on charter service (see Figure 4-7). This appears to be in response to the 1966 Regional Air Carrier Policy.

Figures 4-18 and 4-19 are the plots of traffic density (revenue tonnes kilometers of all scheduled services per point served) for the seven airlines. In Figure 4-20 and 4-21 we present an alternative measure, revenue tonnes per point. These can be summarized as follows:

1. Air Canada has enjoyed a substantially higher density than CP Air throughout the study period. For example, in 1980, Air Canada had 29,000 tonnes per point served versus 17,000 for CP Air.⁵
2. The regional carriers have had a much lower traffic density than the transcontinental carriers. Among the regionals, PWA and EPA have had a significantly higher traffic density in tonnes per point than the other regionals; in 1980, about 8,000 tonnes per point served by PWA and EPA, versus less than 5,000 tonnes per point served by the other regionals. In terms of RTK per point, Nordair fares much better due to its longer stage lengths.

FIGURE 4-14
NUMBER OF POINTS SERVED
BY SCHEDULED FLIGHTS
1964-1981



Legend

- △ AIR CANADA
- × CP AIR
- P.W.A.
- ◇ QUEBECAIR
- + E.P.A.
- * TRANSAIR
- + NORDAIR

FIGURE 4-15
AVERAGE LOAD FACTOR
FOR SCHEDULED PASSENGER SERVICE
1964-1981

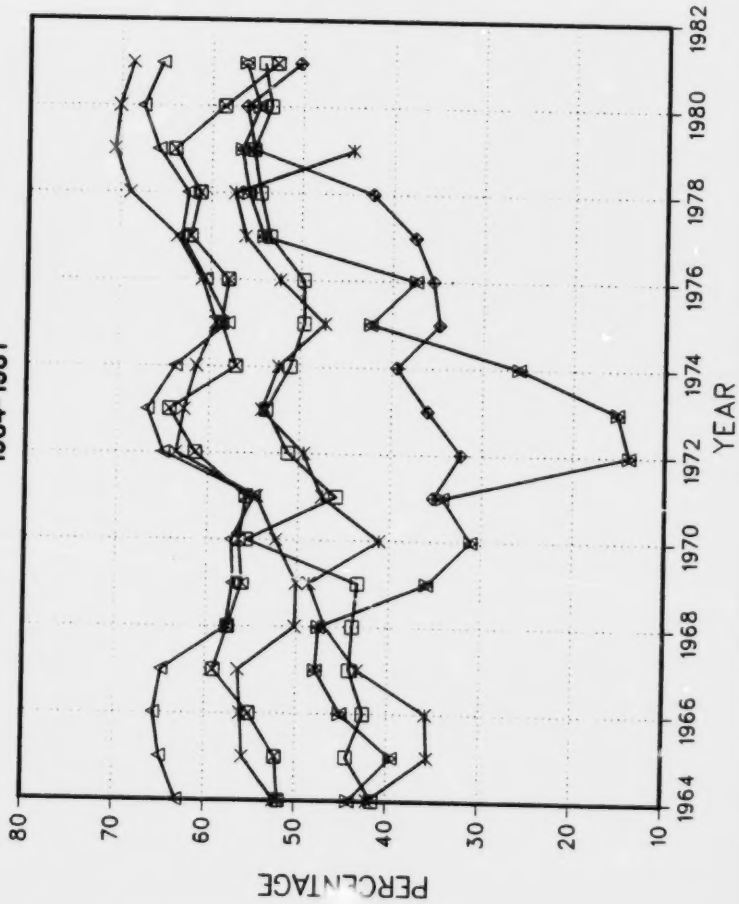
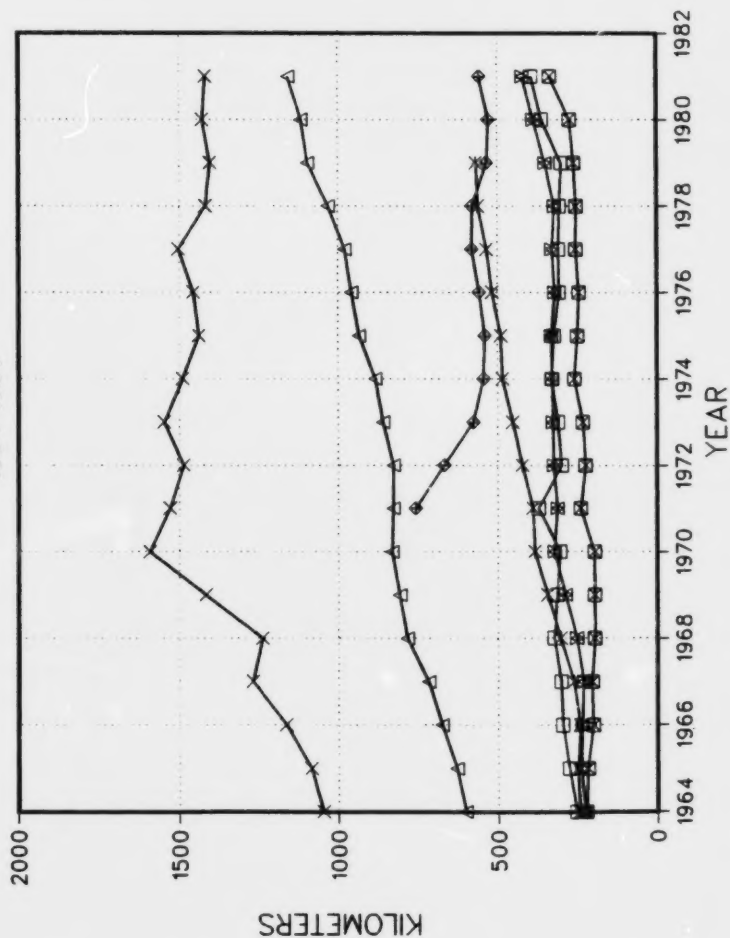


FIGURE 4-16
AVERAGE STAGE LENGTH
FOR SCHEDULED PASSENGER SERVICE
1964-1981



Legend

- △ AIR CANADA
- × CP AIR
- P.W.A.
- ⊠ QUEBECAIR
- ⊞ E.P.A.
- * TRANSAIR
- ⊙ NORDAIR

△ AIR CANADA

× CP AIR

☐ P.W.A.

QUEBEC AIR

E.P.A.

TRANSAIR

• NORDAIR

FIGURE 4-17
WEIGHTED AVERAGE NUMBER OF SEATS PER AIRCRAFT
FOR SCHEDULED PASSENGER SERVICE
1964-1981

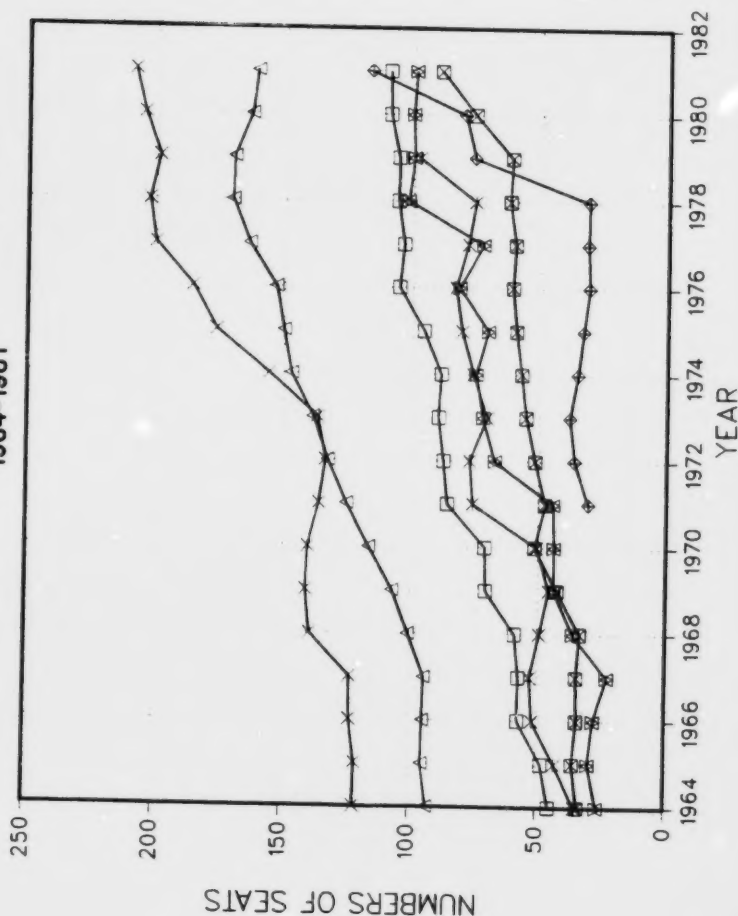


FIGURE 4-18
TRAFFIC DENSITY: TRANSCONTINENTAL CARRIERS
 (Revenue Tonne km/point)
 1964-1981

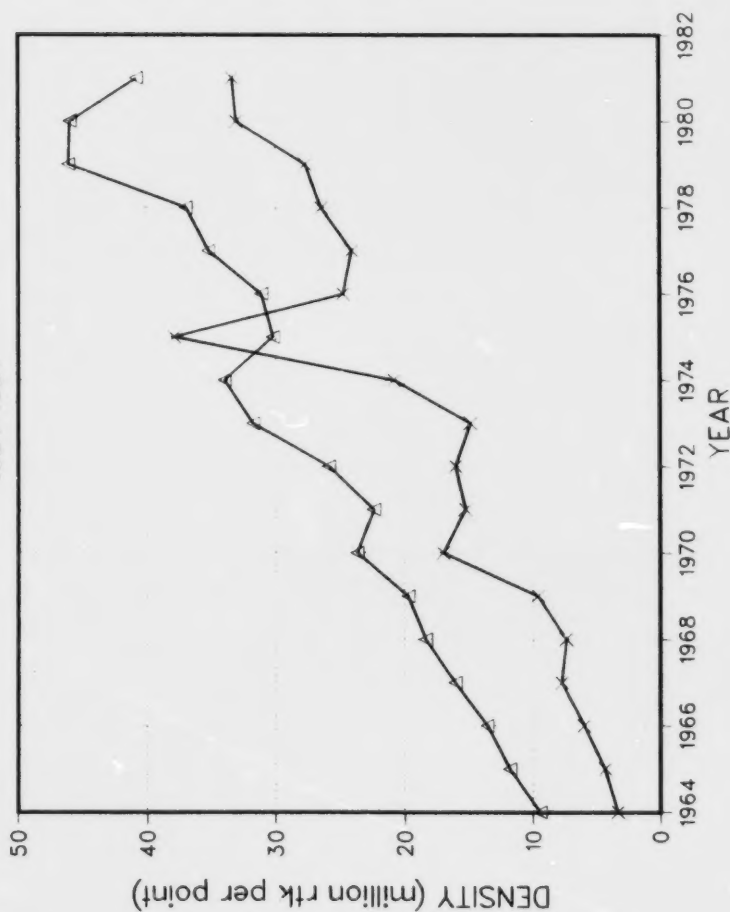


FIGURE 4-19
TRAFFIC DENSITY: REGIONAL CARRIERS
(Revenue Tonne km/point)
1964-1981

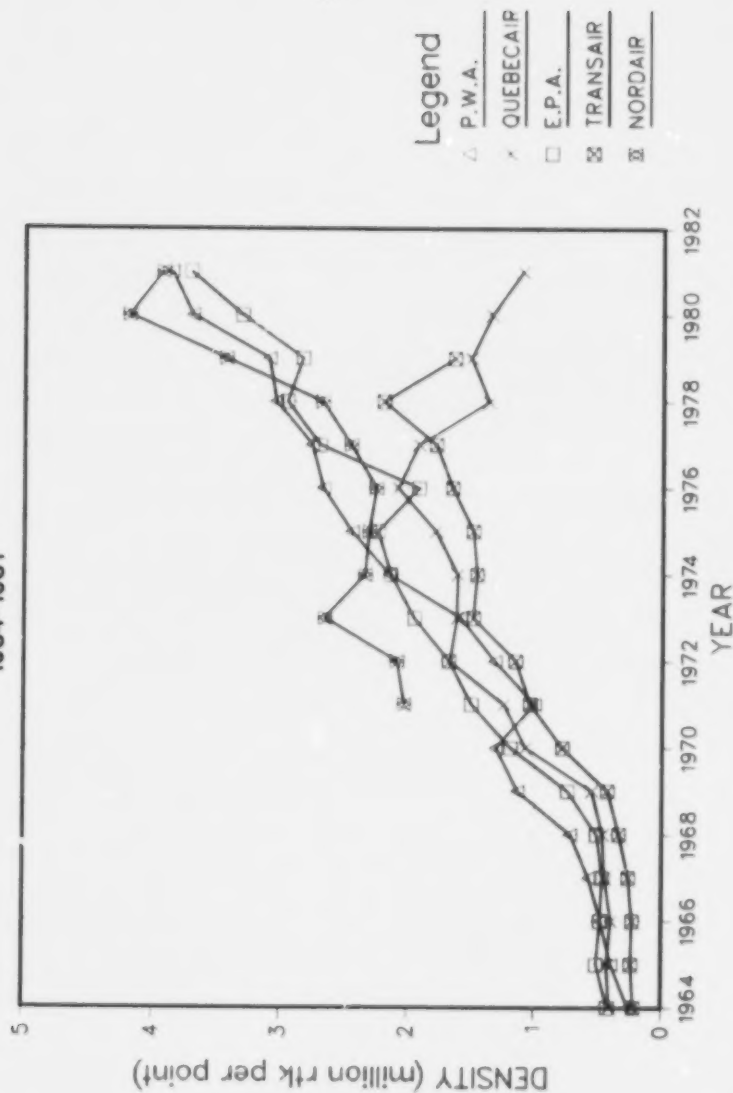


FIGURE 4-20
 TRAFFIC DENSITY: TRANSCONTINENTAL CARRIERS
 (Revenue Tonnes/Point)
 1964-1981

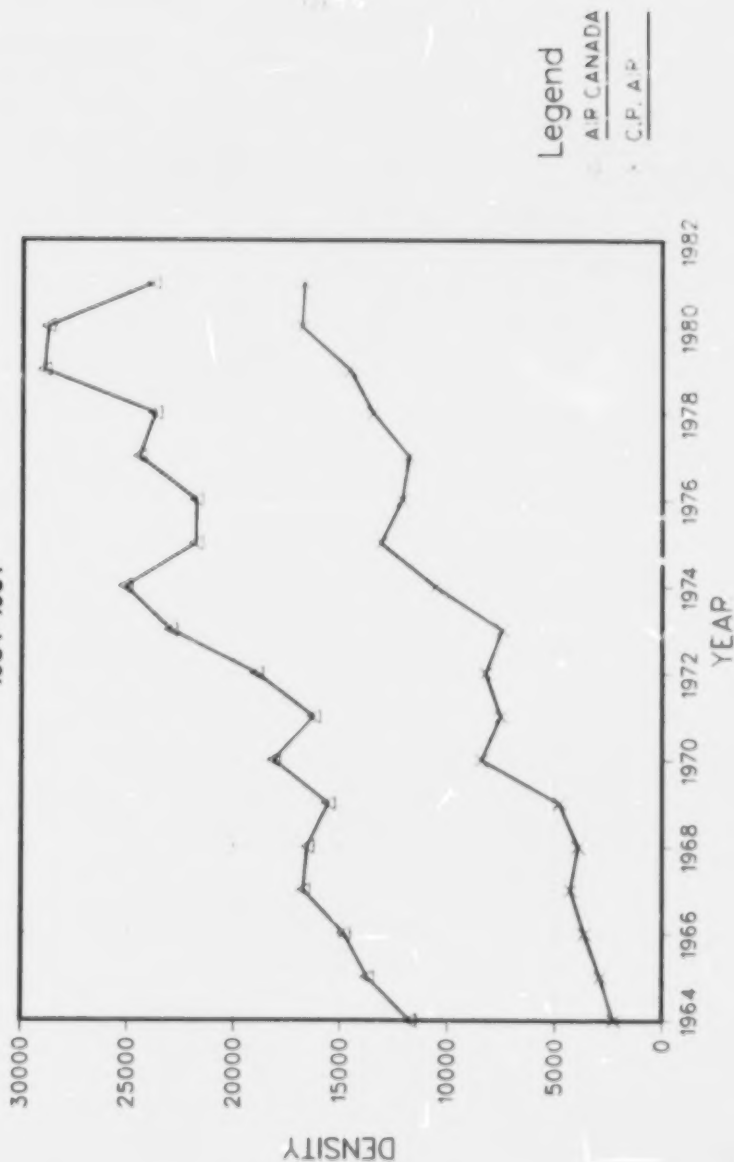
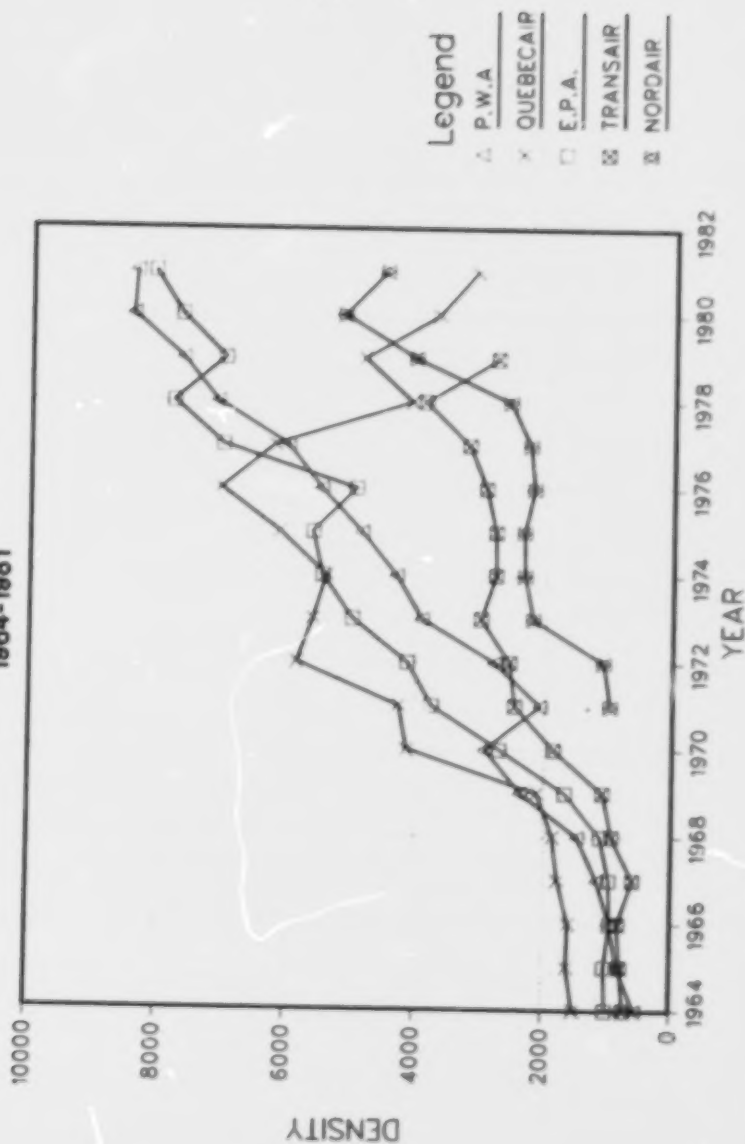


FIGURE 4-21
TRAFFIC DENSITY: REGIONAL CARRIERS
(Revenue Tonnes/Point)
1964-1981



3. Except for Quebecair, all other carriers have experienced more or less steady growth in traffic density throughout the study period. Quebecair's traffic density per scheduled point dropped sharply after 1976 as the carrier emphasized charter services. The gap between Quebecair and the other regionals is quite clear in Figure 4-19.

8.5 Carrier Profits

Our data are sufficiently comprehensive that we are able to compute economic profits from commercial flying services by carrier. We subtract the total cost of inputs used for producing the three outputs (scheduled passenger, scheduled freight, and charter) from the total revenue of those outputs to obtain "computed" profits. This concept of profits follows an economist's definition, as our measure of capital cost includes an allowance for the cost of capital; i.e. a return to capital.

In Figures 4-22 through 4-28 we compare computed profits with the before-tax profits reported by the airlines. The differences between the two profit series occur because of the following reasons:

1. Our "computed" profit is based on the true opportunity cost of the inputs used by the carrier, whereas the "reported" profit is based on accounting costs of the inputs. The difference is especially significant for capital inputs. Aircraft sitting in the desert might not be depreciated for accounting purposes, as no flight hours accrue to charge with depreciation. The capital is nevertheless tied up and not available for use elsewhere. Our measure captures the cost of idle assets.
2. Our "computed" profits (or losses) reflect only the operating profit (or loss) generated from the three outputs (scheduled passenger, scheduled freight, and charter services) whereas the "reported" profits (or losses) include the profit (or loss) from "other flying services" and from "non-flying services". For example, Nordair's contract for ice patrol services to the Federal government are classified as "other flying services", and CP Air's ground service for EPA in Toronto is classified as "other flying services".

FIGURE 4-22
COMPUTED VS REPORTED PROFIT LEVELS
FOR AIR CANADA
1964-1981

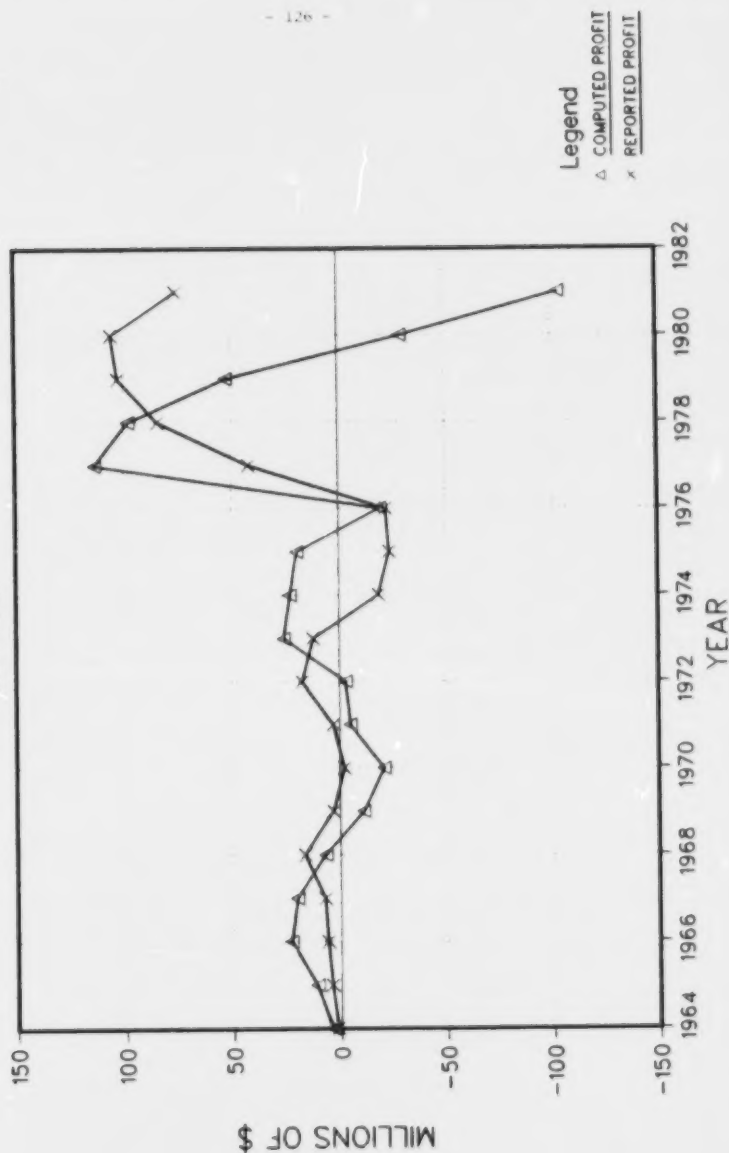


FIGURE 4-23
COMPUTED VS REPORTED PROFIT LEVELS
FOR CP AIR
1964-1981

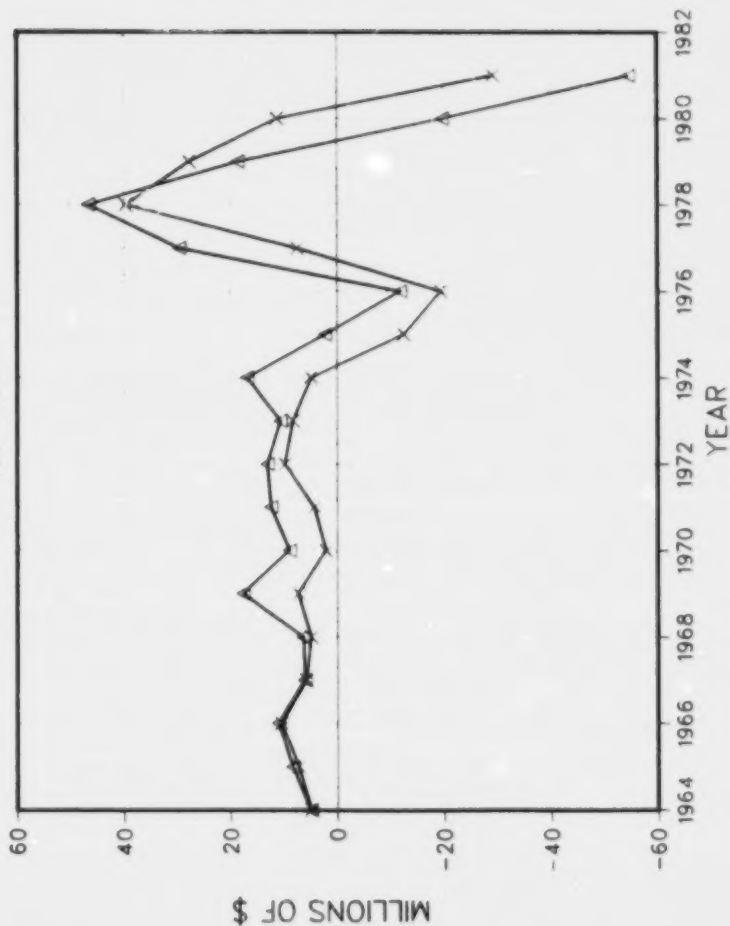


FIGURE 4-24
COMPUTED VS REPORTED PROFIT LEVELS
FOR P.W.A.
1964-1981

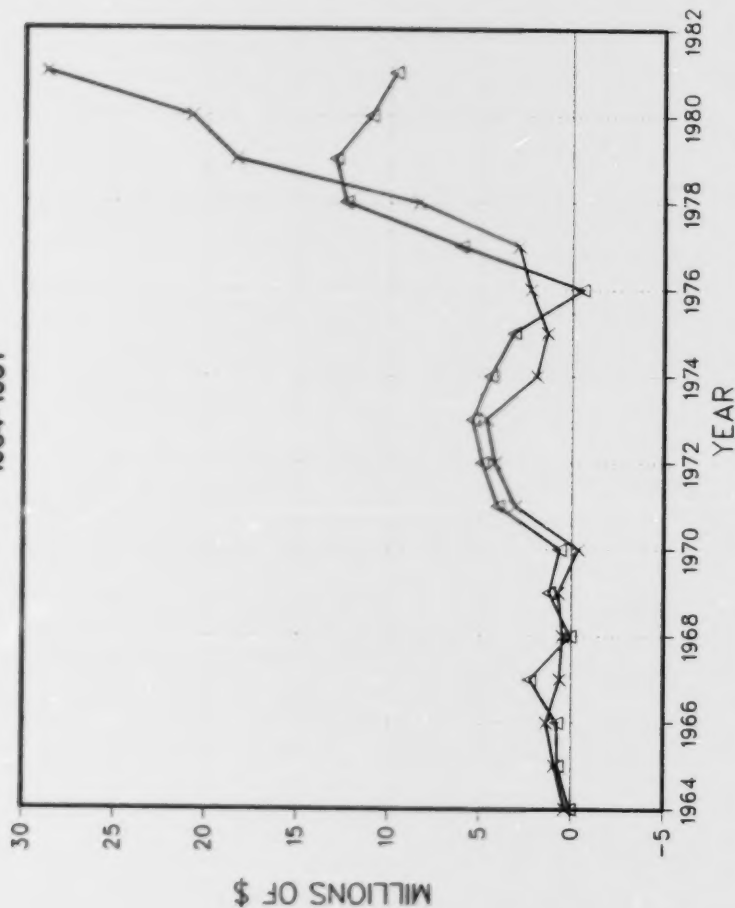


FIGURE 4-25
COMPUTED VS REPORTED PROFIT LEVELS
FOR NORDAIR
1964-1981

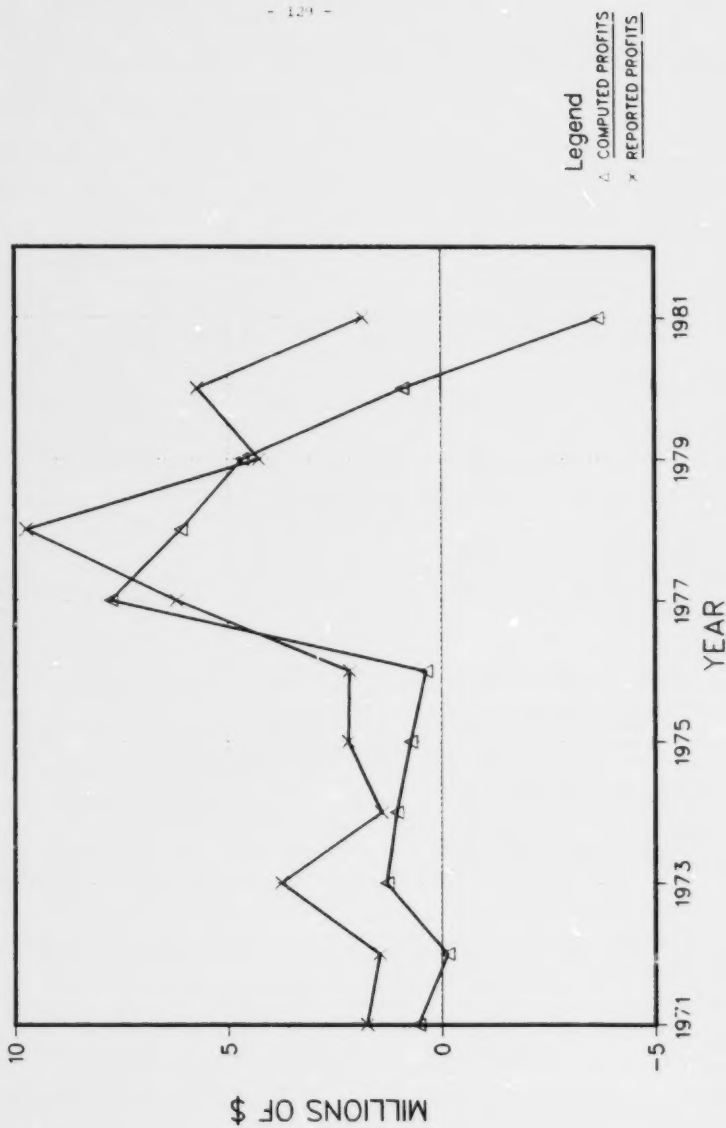


FIGURE 4-26
COMPUTED VS REPORTED PROFIT LEVELS
FOR TRANSAIR
1964-1981

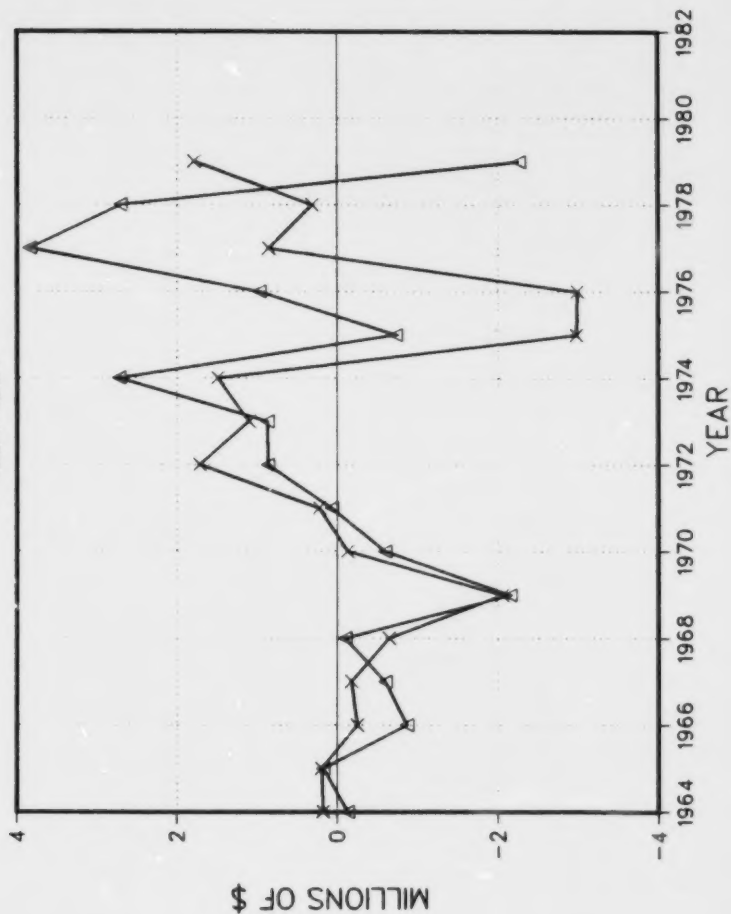


FIGURE 4-27
COMPUTED VS REPORTED PROFIT LEVELS
FOR QUEBECAIR
1964-1981

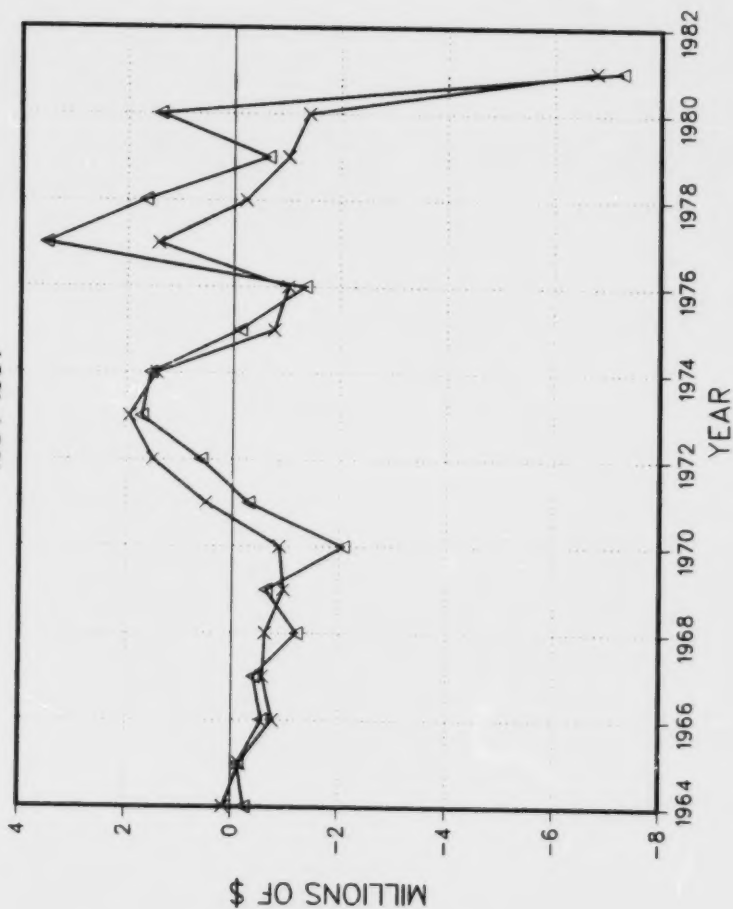
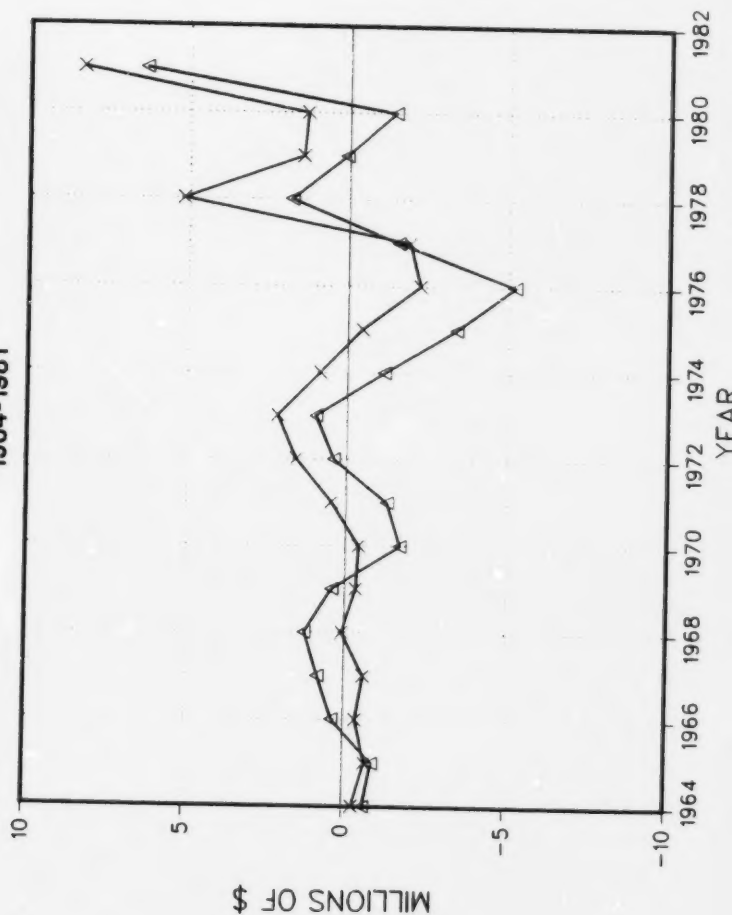


FIGURE 4-28
COMPUTED VS REPORTED PROFIT LEVELS
FOR E.P.A.
1964-1981



Legend
△ COMPUTED PROFITS
× REPORTED PROFITS

3. In computing the opportunity cost of using "air frames and engines" we used 15 years as the economic life for depreciation purposes while the airlines use 20 years for depreciation.

Figures 4-22 through 4-28 reveal the following:

1. Each carrier's total profit (or loss) averaged over the entire study period is roughly equal for the two methods of computation. This suggests that our method of computing the input costs (and thus profit) is a reasonable one. One possible exception to this is the case of CP Air, for which we consistently observed a lower reported profit than computed profit until 1978.
2. Relative to other carriers, PWA achieved a consistent and strong record of operating profit throughout the study period. In fact, PWA reported a small loss only in 1970. Computed profit was slightly negative only in 1976.
3. Our computed profit indicates that all carriers, except PWA and EPA, suffered economic losses in 1981. This is in contrast to the substantial positive profits (about \$70 million) reported by Air Canada. This may have been possible because Air Canada's reported profits were substantially lower than the computed economic profits in 1977 and 1978. All air carriers had reported profits greater than computed profits in 1981.
4. Quebecair, EPA and Transair had significant periods with negative computed profits.

Notes to Chapter 4

1. A detailed description of the data set and construction of variables can be found in our forthcoming book, Gillen, D., Jum, T. and M.W. Tretheway, "Airline Cost and Performance: Implications for Public and Industry Policies" Center for Transportation Studies, University of British Columbia, Vancouver, Canada.
2. CP Air's exceptionally high percentage of revenue generated from scheduled freight service in 1975 was caused by introduction of the combination passenger/freight jet (DC8) between Vancouver and Hong Kong.
3. These are averages and are not reflections of union pay scales. The two may differ depending on the seniority distribution of pilots, the types of aircraft and routes flown, the number of hours of flight time, etc.
4. The weighting is by revenue tonne miles per aircraft. It is to prevent spurious figures for examples such as a carrier with a 747 (500 seats) and a DeHaviland Twin Otter (20 seats).
5. We have not yet been able to determine why CP Air's density jumped in 1975. The data has been verified by both Statistics Canada and CP Air itself. In 1975, CP Air acquired wide bodied aircraft with large cargo carrying ability.

Chapter 5: Productivity and Cost Analysis

A. Introduction

In this chapter, we investigate the economic performance of Canadian airlines, using two related performance measures: Total Factor Productivity (TFP) and unit cost. As a check we compare the results to similar measures of economic performance based on U.S. airline data. This material draws heavily from Gillen, Oum and Tretheway (1985) and we refer the reader to it for greater detail and explanation.

TFP is the amount of aggregate output produced by a unit of aggregate input. It recognizes the nature of airline production in which multiple outputs are produced using multiple inputs. TFP is more widely accepted among economists as a correct measure of productive efficiency than partial factor productivities such as labour productivity.

Since productivity is a mirror image of cost efficiency, we use the results of TFP analysis as a starting point to estimate several alternative neoclassical airline cost functions. The cost functions will be used to investigate such crucial issues as economies of traffic density, firm size and scope as well as to simulate the impacts of alternative regulatory and ownership choices on carrier and industry performance.

In view of the emphasis of this study on the analysis of regulatory and ownership policy, we choose to relegate the theoretical and the technical discussions on how we compute TFP and on why we choose to use the particular form of translog cost function to Gillen Oum and Tretheway (1985). In the remainder of this chapter, we will limit our discussions to empirical results of TFP and cost function analysis, and to their policy implications.

B. Total Factor Productivity

Our assessment of Canadian airline performance begins with measure, total factor productivity (TFP). TFP is defined simply as the amount of aggregate output produced by a unit of aggregate input. It differs from simpler concepts of productivity such as output per man-hour, by recognizing a) that more than one type of output is produced, and b) that inputs other than labour are used. For example, a firm with high labour productivity due to the use of large amounts of capital might not be viewed as being productive in a total input or a "total factor" sense. TFP corrects for the multiple output problem by giving high quality outputs a greater weight in the aggregation of outputs into a single measure. Similarly, it recognizes and weights appropriately various inputs and individual inputs of different quality. The detailed methodologies on output and input aggregations, TFP computation and TFP analysis are described elsewhere (Gillen, Oum and Tretheway, 1985).

In Table 5-1 we show levels of TFP for the seven Canadian airlines, 1964-1981. We normalized our series so that TFP is unity for CP in 1971. This provides a reference point for all comparisons. Numbers greater than unity indicate greater productivity than CP Air had in 1971. In Figure 5-1 we graphically compare the level of TFP for each carrier. Here we have averaged the 1964-1981 TFP levels for each carrier except Transair (1964-79) and Nordair (1971-81). We see that CP Air has the highest average level of TFP, 15% above that of Air Canada. Nordair has an average TFP level 2% below that of Air Canada.¹ The remaining regional carriers have TFP levels between 35% and 50% lower than Air Canada. Figure 5-2 graphically portrays TFP levels for carriers in individual years. We observe that

TFP, Output Quantity, and Input Quantity Indices
(C.P. Air 1971 = 1.0)

	YEAR	TFP Index	Aggregate Output Index	Aggregate Input Index
AIR CANADA	1965	0.62	1.37	2.19
	1971	0.85	2.89	3.41
	1978	1.17	4.85	4.15
	1981	1.07	5.34	4.97
	MEAN	0.88	3.51	3.99
C.P. AIR	1965	0.72	0.42	0.58
	1971	1.00	1.00	1.00
	1978	1.42	2.04	1.44
	1981	1.32	2.50	1.89
	MEAN	1.02	1.35	1.33
PWA	1965	0.49	0.05	0.10
	1971	0.68	0.19	0.28
	1978	0.87	0.37	0.43
	1981	0.76	0.52	0.68
	MEAN	0.62	0.24	0.39
QUEBECAIR	1965	0.35	0.01	0.04
	1971	0.51	0.04	0.08
	1978	0.83	0.21	0.26
	1981	0.46	0.09	0.20
	MEAN	0.56	0.09	0.15
EPA	1965	0.21	0.01	0.06
	1971	0.46	0.05	0.11
	1978	0.75	0.13	0.18
	1981	0.82	0.15	0.18
	MEAN	0.53	0.08	0.14
TRANSAIR	1965	0.47	0.02	0.05
	1971	0.55	0.06	0.10
	1978	0.89	0.13	0.14
	MEAN	0.61	0.06	0.11
MORDAIR	1971	0.85	0.08	0.10
	1978	1.06	0.20	0.19
	1981	0.85	0.24	0.28
	MEAN	0.86	0.18	0.21
INDUSTRY MEAN		0.89	0.86	0.97

Figure 5-1
AVERAGE TFP LEVELS BY AIRLINE
Air Canada = 10
1964 to 1981

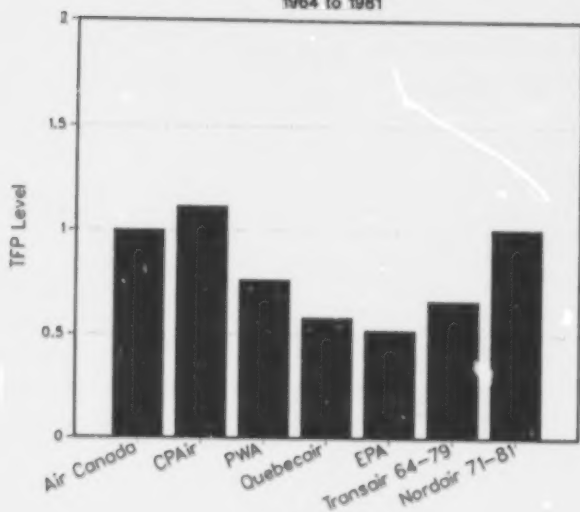
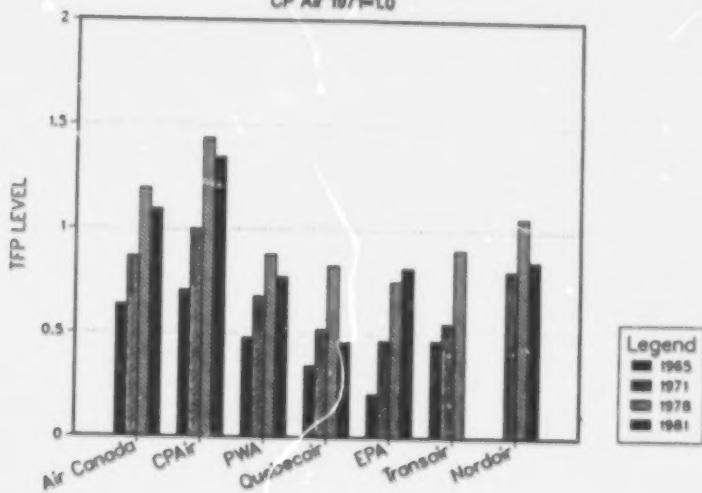


Figure 5-2
TFP LEVELS BY AIRLINE
Selected Years
CP Air 1971=1.0



Legend
 ■ 1965
 ■ 1971
 ■ 1978
 ■ 1981

CP Air has had the highest TFP levels in all years. Most of the air carriers had a fall off in TFP in 1981 which no doubt is related to the fall off in traffic due to the recession.

The finding that CP's level of TFP is higher than Air Canada's does not necessarily imply that CP is more efficient since our concept of TFP does not necessarily translate into an efficiency shift of the cost or production functions. Total TFP may differ due to differing characteristics of the operating environment among firms; different stage lengths, for example.

In Figure 5-3 we plot averages over all carriers of TFP for each year.² From this we see that the average level of industry productivity grew steadily from 1964 to 1978; in fact more than doubling. In 1978 the economic downturn and other factors took hold and productivity fell to 1.25 by 1981; equivalent to the level in 1975. In the last two columns of Table 5-1, we present these aggregate output and input indices. Again these are scaled so that CP in 1971 has the value of unity.

C. Analysis of Differences in TFP

We wish to explain why TFP differs between firms, and what accounts for its growth (or decline) over time. The basic approach involves regression analysis to attribute TFP growth to several factors. Of particular interest in the study were the explanatory factors of stage length, traffic growth, network size, load factor and output mix.

Our basic findings are indicated in Table 5-2. This table gives "elasticities" of TFP with respect to individual factors. Thus, a 1% increase in traffic leads to a 0.12% increase in TFP. Increasing the size of

FIGURE 5-3
Average TFP Levels Of Canadian Airlines
1971 TFP = 1.0

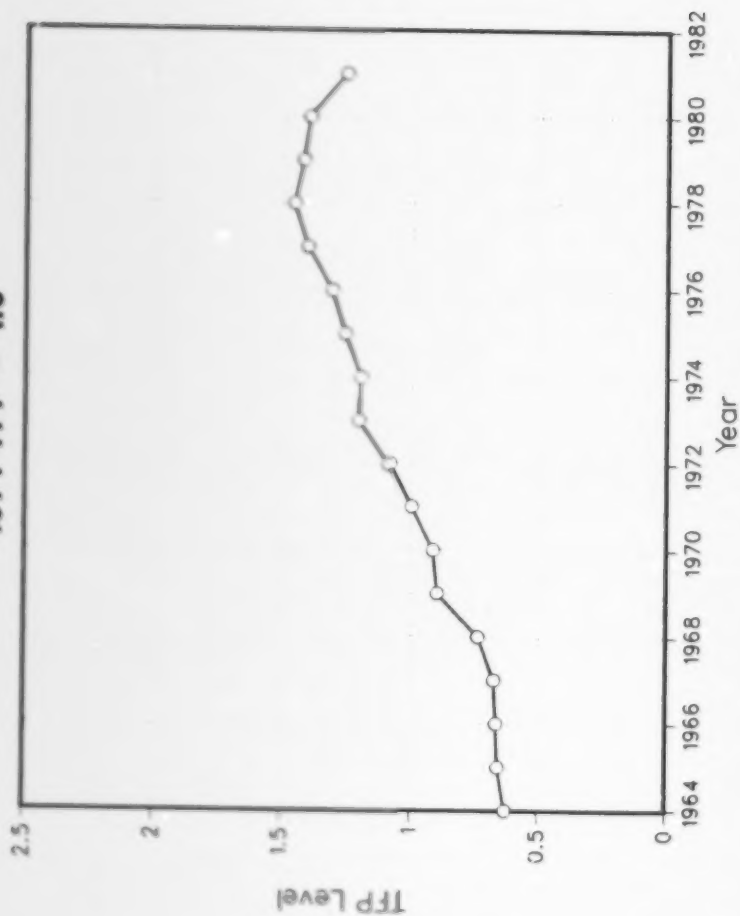


Table 5-2

TPP Elasticities

Variable	Elasticity of TPP with respect to Variable
Output (traffic level)	.32
Points served	-.22
Load factor	.013 (not statistically significant)
Stage length	.12
Relative freight output	.005 (not statistically significant)
Relative charter output	.04
Level of capital stock	-.13

the network (i.e., the number of points served) leads to a 0.22% decrease in TPP - holding the level of traffic constant. The main results indicate the following about the Canadian airline industry:

- There are significant economies of traffic density, i.e., economies achieved when traffic growth is within a network of fixed size,
- There are mild, and perhaps insignificant economies of firm size, i.e. economies achieved when traffic growth is due to increasing network size,
- There are important economies of stage length, i.e., it uses less resources to fly longer stages for a fixed amount of service measured in say revenue passenger miles,
- The Canadian airline industry has invested in too much capital.

Using these results we then examined TPP for the individual airlines after controlling for the factors in Table 5-2. We find that all Canadian airlines have roughly similar levels of productivity after we take into account differences in stage length, etc. Nordair, Transair and PWA were found to be slightly more efficient and EPA slightly less than Air Canada, CP Air and Quebecair which had similar productivities.

We also found that if we did not control for the amount of capital air carriers have available, Air Canada is much less efficient. This was true to a lesser extent for CP Air. This result and that described in the preceding paragraph suggest that Air Canada has too much capital (for example, redundant airplanes) which regularly impacted on its economic performance.

D. Cost Function Analysis

Having completed measurement and analysis of productivity for the Canadian airlines we now turn our attention to estimation of a cost func-

tion. The methodology involves specifying a cost function consistent with widely held principles of neoclassical micro-economics. The cost function is given a specific formulation, the "translog" form which has become state-of-the-art for economic studies of this sort. Below we briefly sketch the nature of this specification and refer the reader interested in greater detail to Gillen, Oum and Tretheway (1985).

A realistic characterization of the cost structure of the airline industry requires not only the incorporation of multiple outputs and multiple inputs but also the special characteristics of the route networks and changes in input productivities.

As a starting point we specify the multiple output cost function as:

$$C = C(Y_1, Y_2, \dots, Y_n, W^p)$$

where

$$Y_i = \text{output of class } i, i=1,2,\dots,n,$$

$$W^p = [W_1^p, W_2^p, \dots, W_n^p],$$

$$W_i^p = W_i \exp(a_i t)$$

(price of input i adjusted for technological changes over time),

$$W_i = \text{price of input } i,$$

$$t = \text{time variable indicating the year.}$$

This general form is modified in order to take into account the effects that technological change and market characteristics and conditions have on cost, (the conditions vary over time and between carriers). This is achieved by replacing the nominal output Y_i with an output function, $\phi_i(Y_i, q_i)$ which contains both output and market variables (attributes), q_i , which describe the nature of the i^{th} output

class. In addition we explicitly introduce a measure of the carrier's network size by including the number of points, served P . Firm specific effects which vary by firm but are constant over time are captured by binary variable F . Thus, the most general form of the cost function is represented as

$$C = C [F, P, \phi (Y_1, Q_1), \dots, \phi_m (Y_m, Q_m) W^*].$$

It is to this cost function that we give a specific form called the "trans-log".

This formulation of the cost function allows us to investigate two of the most interesting and debated features of the airline cost structure, namely economies of scale and economies of multiple outputs (so-called economies of scope). With regard to scale economies, we are able to distinguish economies of traffic density and economies of firm size. The former measures the variation in unit costs for a network of a given size, while economies of firm size measure the variation in unit costs with respect to proportional changes in both network size and passenger, freight and charter traffic.

We now turn our attention to the important results of our analysis. In the examination of the cost structure of Canadian airlines we observed the following:

1. All airlines experienced constant returns to firm size, with the exceptions of Nordair [which in 1980 exhibited increasing returns to firm size (point estimate 1.19, t-statistic 2.0)], and Air Canada [which had weak evidence of decreasing returns to scale (point estimate .85, t-statistic 1.5)]. Unit costs would not fall if Canadian carriers expanded output by adding more cities to their networks.

2. There is evidence of significant economies of traffic density for all airlines except, possibly, Air Canada. Unit costs would decrease if carriers expanded traffic within their existing networks. Unit cost could also fall if a carrier dropped a low density point and added a high density point.
3. There is cost complementarity between scheduled passenger services and charter services only if the proportion of charter services is less than 5%. Expansion by a carrier of charter service beyond 5% increases the marginal cost of scheduled passenger service.
4. Of the firm's output characteristics investigated, stage length appears to be the most important in affecting costs. The minimum cost firm size appears to decrease rapidly as stage length decreases.

We can use these results to examine an historical Canadian air transport policy. The key measures of the cost structure identified suggest that the Regional Carrier policy of confining the regional carriers to particular geographic regions and therefore markets, and the emphasis on their role of providing 'feed' to the national carriers, had a significant negative impact on the regional's performance. They were forced to expand their networks within regions and thus could not obtain stage length economies. The failure to allow regionals into a broader domestic market had a number of additional implications. First, the regional carriers were induced into providing a larger proportion of charter output than was cost efficient. This adversely affected the cost of providing scheduled passenger services - their primary mission under the policy. Second, the regional carriers had limited opportunities for exploiting economies of density. A high density point exterior to or bordering upon the region if substituted for a low density point within the region would have meant a fall in unit costs from density and stage length economies.

Cost differences among carriers are due to both firm size and traffic density effects. The scale component is, in turn, affected by output mix and stage length. The findings of a) constant returns to firm size, b) strong increasing returns to traffic density and to stage length, and c) lack of complementarity between scheduled passenger and charter services in the existing regional carrier market configurations, lead us to conclude that any attempt to expand the scale (traffic and points) of regional carriers without fundamentally altering the nature of their network (for example stage length and participation in denser routes) would not improve their cost efficiency. Therefore, the New Canadian Air policy announced on May 10th, 1984, abolishing the Regional Air Carrier Policy appears to be a step in the right direction.³

Our findings of constant returns to firm size indicate that Air Canada might not have a cost advantage over other Canadian carriers due to its large size. (If anything, the results suggest that Air Canada may have a slight cost disadvantage, *ceteris paribus*). Its high output density, however, may give it an important edge. Air Canada, for example, has an output density of 46 million RTK per point served compared to CP Air's 33. The results suggest that Air Canada is closer to the minimum efficient density than CP Air or the regionals.

In addition to the total cost model just described, we also estimated a variable cost function. The latter does not imbed the assumption that air carriers have chosen optimum investments in capital. The variable cost model confirmed most of the empirical results concerning cost structures obtained from the total cost model. In addition, it revealed that Air

Canada's productivity (TFP), or equivalently its cost performance, suffered due to its excess of capital. The regional carriers have suffered from excess capital stock to a lesser extent. Although the point estimate indicated that CP Air also has some excess capital stock, the evidence was not statistically significant. Air Canada's performance was adversely affected by its excess capital stock significantly more than was CP Air's. These observations are consistent with the fact that Air Canada has several idle aircraft parked in the desert, and that the regionals have had fleets with some relatively underutilized planes acquired for charter services.

Finally, from our calculations of labour demand elasticities (-.60) we expect an increase in industry employment with lower fares, ceteris paribus. We note that this assumes no radical changes in the structure of the industry's production process. Should significant productivity increasing changes in union work rules occur, then the increase in industry employment may be attenuated or become negative. However, the lower cost structure that would occur with such changes could lead to yet lower fares which ultimately would increase employment.⁴ In the U.S., where adjustment to the new deregulated environment is still being carried out, the airline industry employed 328.6 thousand in 1983 as compared to the 1978 employment of 329.3 thousand.

With regard to the productivity of Canadian airlines, our TFP and cost results lead us to these conclusions:

1. Since productivity depends on several factors [scale and mix of outputs, attributes of outputs, network and market variables], inter-firm comparison of performance should be based on the residual (unexplained) TFP or residual cost, i.e., the analyst must control for such factors before making comparisons between firms.

2. After controlling for these factors, the unexplained performance levels (residual cost and TFP) are lower for Air Canada than for the regionals. However, after further controlling for capital stock level we observe no significant difference in the unexplained performance levels of the six carriers. This indicates that the differences in performance were caused principally because of poor investment decisions on the part of Air Canada.
3. By examining the sources of TFP changes, we speculate that efficiency improvements under a U.S. style deregulation would be smaller in Canada because the absence of scheduling competition in Canada means that U.S. productivity gains from increasing low load factors will not occur here.

Comparisons to U.S. Results

Caves, Christensen and Tretheway (1985) estimated a neoclassical cost function for the U.S. Airline Industry. The methodology they used for constructing variables and for estimating the cost function was similar to that employed here. Given these similarities, we thought it would be useful to compare their results with those obtained here.

Like this study, the U.S. study found evidence of constant return to firm size. Here we found an overall estimate of returns to scale of .97 from the total cost function, and 0.99 from the variable cost function. In the U.S. study, the total cost function found returns to size at the sample mean to be 1.06 (t-statistic of 1.3) while a variable cost specification found returns of .98 (t-statistic of .4). (Note: the output mean of the U.S. study was larger than the Canadian study). The U.S. study found point estimates of RTS both above and below unity, but for none of the sample points could the hypothesis of constant return to firm size be rejected.

This study found evidence of returns to traffic density for every sample point. The industry mean value of RTD was 1.18 for the total cost

function, and 1.49 for the variable cost function. The U.S. study found that all values of RTD lay between 1.21 and 1.29, using the total cost function. For each observation the hypothesis of constant returns to traffic density was statistically rejected. At the mean of the U.S. data, returns to traffic density were 1.24 with a t-statistic of 4.7. The U.S. variable cost function also supported the notion of returns to density with a mean value of 1.17 (t-statistic of 2.9). For this model, however, while the point estimates of RTD are greater than unity for all sample points, the hypothesis of constant returns to density cannot be rejected for the U.S. trunk air carriers. It is interesting to note that we found a similar result here for Air Canada, the only Canadian air carrier whose size is similar to that of the U.S. trunks.

The U.S. Airline cost study used a single aggregate measure of output and thus did not look at economies of scope. All of the U.S. trunk and local service airlines produce roughly similar mixes of scheduled passenger, scheduled freight and charter services. They do not have the extreme variation in output mixes that have been observed in Canada. It is noteworthy that the U.S. did not have an airline policy equivalent to Canada's Regional Carrier Policy. The latter confined carriers to specific regions and generally denied them high density routes. Early U.S. policy did generally result in local service carriers operating within regions.⁵ But the "Route Strengthening" program in the U.S. allowed these carriers to expand in scheduled markets and intentionally awarded them high density and some longer haul routes.

We conclude from this comparison of the U.S. results to those obtained here for Canada that our findings are remarkably consistent with those in

the U.S. While there are some important differences in the airline environments in the U.S. and Canada, intuitively it seems plausible that the two countries operate with similar production relations. The confirmation of this we believe lends plausibility to our findings.

Conclusion

The analytical framework of combining total factor productivity measures with cost function estimation to assess performance and evaluate policy has been successful. Our approach not only allowed us to make performance comparisons between air carriers and over time, but also to separate measures from actual productivity, the latter controlling for differences in the operating environment. The cost function specification was rich enough to provide estimates of firm size and traffic density economies, inter-product cost relationships, as well as the effects on cost of differences in characteristics of the operating environment.

Performance comparisons based on observed TFP and cost levels indicates that the trunk carriers have been more productive than the regional carriers. This is the same result other studies using simple productivity measures have reached. However, once we corrected these measures for firm size and traffic density economies, and differences in the operating environment, the relationship between trunks and regionals is reversed. We find the regional carriers have been more economically efficient than Air Canada and to a lesser extent than CP Air. From our TFP models we observed that the apparent poor performance of Air Canada is due to over investment in capacity to provide services. Once we control for this over investment all the Canadian carriers have roughly similar levels of productivity. Our

variable cost model reveals that Air Canada has the highest level of excess capital stock, followed by the Regional carriers. CP Air appears to have the least excess capacity.

We found the multiproduct cost function with hedonic output aggregators to be a rich specification. The model allowed us to make the crucial distinction between economies of firm size and economies of traffic density. The multiproduct specification allowed us to observe the impact of output mix on carrier costs and performance. Several important results were revealed. In general, air transport in Canada is subject to constant returns to firm size, indicating that by itself, adding new destinations to a carriers' network will not lower unit cost. In contrast, significant economies of traffic density exist (except perhaps for Air Canada). Carriers can lower unit cost by increasing traffic within existing markets. Similarly, adding a new point with high traffic density can lower system average cost. These findings seem to underscore the importance of a network with good traffic feed. Good feed can increase traffic density for a given carrier. A properly designed hub and spoke system, which effectively increases the density on any given network link, could be desirable from a cost point of view.⁶

Our investigation of interproduct complementarity (i.e., economies of scope) yielded very important results. Charter and scheduled passenger services are compliments only for fairly low proportions of charter services. The regionals, with a traffic mix often consisting of 50% charter services experience no such complementarity. In fact, for the regionals, the cost of scheduled services are higher because of the presence of such a large portion of charter services.

We believe there is an intuitive explanation for this. A carrier operating predominantly scheduled service can make some contribution to overhead by flying the occasional charter in off-peak periods; weekends perhaps, or slow months of the year. In this case, aircraft are acquired for scheduled services and charter services simply pick up the slack time.

In contrast, the regionals, with such a high charter proportion cannot rely on idle time of aircraft purchased for scheduled services. They must acquire aircraft specifically to satisfy the large amount of charter services they are selling. This will not lower costs of scheduled services. In fact, if these dedicated charter aircraft are not utilised fully, overall system costs will rise. Scheduled services may need to cover the costs of maintaining charter fleets (and personnel) that may often be idle.

Our findings lead us to conclude that the regional carrier policy has been costly to Canada. The policy restricted carriers to particular geographic regions and thus limited their ability to expand scheduled services and increase stage lengths. There was a clear incentive for the regionals to seek growth in charter markets. They did so with a passion and as a result Canada's industry wide costs of air transport were higher than they need have been.

Because of this we feel that the abolition of the Regional Carrier Policy on May 10th, 1984 was a step in the right direction. The new policy also provides some opportunities for carriers to adjust their networks to find the optimal stage lengths and sets of feeder routes to increase their route densities.

Notes to Chapter 5

1. Data for Nordair are missing for 1964-1970. When examining the averages displayed in Figure 5-1, one must recognize that a 1964-1971 T average for Nordair would be below the value of 9.98 in the figure.
2. These are geometric averages. Thus Air Canada has a proportionately greater weight than P.W.A., etc. in the computation of the "industry average."
3. There are, however, other problems with the May 16th, 1986 policy. See Oum and Tretheway (1984) for a discussion.
4. Oum and Gillen (1983) find that the demand for air passenger services is price elastic.
5. See Eads (1972) for a discussion of U.S. policy toward local service carriers.
6. Complex type hub and spoke operations, where flights come in and leave the hub in batches could offset this. In such a system labour and sometime capital can be idle for long stretches of time.

Chapter 6: Demand for Air Travel

Airline regulations and government ownership of Air Canada are likely to affect the airline cost performance and competitive behavior for various routes. These in turn are likely to influence airfares, and thus affect travel volumes. In order to simulate the impacts on travel volume of the alternative policies, we start by summarizing the results of price and income elasticities obtained by Oum and Gillen (1983), and Oum, Gillen and Noble (1984). For the aggregate of all air travel, the studies found the price and income elasticities indicated in Table 6-1. The data publicly available in Canada does not allow one to distinguish the type of routes. Nevertheless, the elasticities found for Canada and those found for the U.S. are broadly similar.

Table 6-1 shows that both income and price elasticities are significantly higher for vacation than for business routes. Although we do not have estimates of the elasticity of demand with respect to travel time (or departure frequency, a measure of service quality) it is likely to be higher for business than for vacation routes. The following elasticity estimates reported in De Vany (1974) and shown here in Table 6-2 illustrate that travellers on short distance (business) routes are more sensitive to travel time but less sensitive to airfares than those on long distance routes.

Table 6-1

Price and Income Elasticities
Canadian and U.S. Air Transport

	Price elasticity	Income elasticity
Canada	- 1.10 ~ 1.30	1.60 ~ 2.50
U.S.		
Business Routes	- 1.15	1.45
Vacation Routes	- 1.52	2.07

Table 6-2
Elasticities by Trip Length

Distance (miles)	Time Elasticity	Price Elasticity
400	-.51	-1.02
650	-.45	-1.07
1500	-.39	-1.14
2500	-.37	-1.17

Source: De Vany (1974)

In general, there appears to be an explicit trade off between price and quality of service elasticities. While the evidence is not clear on the relationship between price and income elasticities, the purpose of trip (business or pleasure) is more important than the income level of the individual traveller.

Table 6-3, using U.S. data, further breaks down price elasticities by route type to indicate different responses for different classes of air fares. Tables 6-1 and 6-3 indicate, as one would expect, that both price

and income elasticities are greater for vacation routes than for business routes. Table 6-3 further indicates that only first class travellers have inelastic demands. Discount class and even regular economy class travellers have quite elastic responses. The important point here is that for full-fare economy as well as discount tickets, the increase in traffic due to a price cut outweighs the loss in revenue per customer (i.e. yield), so that total revenues go up.

Table 6-3

Price Elasticities by Route and Fare Class
U.S. Data

	First Class	Economy	Discount Fares
Business Routes	- .60 ~ - .85	- 1.3 ~ - 1.45	- 1.55 ~ - 2.0
Vacation Routes	- .75 ~ - .80	- 1.4 ~ - 1.6	- 1.75 ~ - 2.0

One, of course, cannot apply these findings without caution to Canadian airline markets. These findings are based on U.S. data. Further, no attempt has been made to investigate how responses differ by time of year, day of week, etc. Further, these findings are for marginal responses only. It would be unwise to use these figures unaltered to determine effects of deep discounts, for example.

In our simulations and analysis in subsequent chapters, we generally assume the lower values of price elasticities and apply these elasticities to all Canadian markets. If the resources (both budget and data) became

available, we would develop a more detailed demand model for Canadian air transport. This model would rely only on Canadian data and would be route and fare class specific, distinguishing time of year, day of week, etc. Only with a properly specified demand model can our cost results be used to analytically determine outcomes in Canadian airline markets. When our incomplete demand model leaves gaps in the analysis to follow, we have had to rely on our own judgement to complete the discussion.

Chapter 7: U.S. and Other Experiences with Deregulation

A. Introduction

As Canada contemplates regulatory reform in Air Transport, it is natural to look to the experiences of others to gather information as to what changes might occur. The U.S. experiment with deregulation is widely known and much has been written about it.¹ Less recognized is the experience of Chile, which deregulated its air transport markets in 1979. In the past year or two several other countries have undertaken or contemplated regulatory reform. The U.K., New Zealand, Turkey, Japan, Australia, the People's Republic of China and the Arabian Gulf States are examples.

The U.S. and Chile provide interesting cases. Since both have had several years experience with deregulation, some of the effects may now be observed. The U.S. experience, of course, is not wholly relevant to Canada, at least in part due to its much larger size (284 million passengers per year versus Canada's 20 million). Chile, on the other hand, is much smaller than Canada (less than one million passengers). In this chapter we examine these two experiments in an attempt to shed light on some of the impacts that might occur should Canada deregulate.

In addition to Canada and Chile, we also look at the recent legislation passed in New Zealand (3 million passengers per year). While it is too soon to observe the impacts of the 1983 and 1984 deregulation steps, we found that the approach New Zealand chose for implementing regulatory reform to be quite interesting for Canada.

B. U.S. Deregulation

There are many accounts of the evolution of U.S. deregulation, the actual legislation passed, and the major impacts of it.² We do not intend to provide here yet another accounting. Suffice it for us to state that U.S. deregulation is characterized by the following aspects:

- elimination of all route entry and exit regulation.
- replacement of the "Public Convenience and Necessity" requirement for entry as a carrier into the industry with a "Fit, Willing and Able" criteria.
- elimination of all regulation of prices and conditions of service.
- a subsidy program to maintain service to small communities for a period of ten years.
- a labor protection program that was totally ineffective.

We remind the reader that the U.S., unlike Canada, never regulated capacity, frequency of service or choice of aircraft.

Although the 1978 U.S. Airline Deregulation Act provided for a phased implementation of reform, the U.S. Civil Aeronautics Board, under the chairmanship of Dr. Alfred Kahn, effectively moved to complete deregulation immediately after its passage. (Some would say before its passage). Because entry was made totally free, the U.S. industry witnessed the emergence of new carriers within two to three years after its passage. Most of these can be characterized as low cost, non-union and without restrictive work rules. As these carriers entered markets, severe pressure was put on incumbent carriers.

Before the appearance of the new carriers (it takes a year or two to organize an airline from scratch), carriers which had been confined to specific city pair markets began to branch out, entering other markets when they saw some synergy with current operations or lucrative profit potential. Several charter carriers, such as World and Capital, commenced scheduled services. Intra-state carriers crossed former regulatory boundaries. Local Service carriers started to add transcontinental routes suited to their networks.

Fares were reduced prior to deregulation in the "liberalized" regulatory environment of 1976-1978. In 1976, CAB chairman John Robson allowed U.S. charter operators to offer Advanced Booking Charters, a class of service that did not require charter travellers to be members of an affinity group. ABC fares made anyone eligible for low fare charter service. The scheduled airlines responded by offering deeply discounted fares (such as "Supersavers") on routes competing with ABC charters (such as New York - Los Angeles). These gradually spread to other routes. With the implementation of deregulation, discount fares have become available on most U.S. routes.

In Appendix A, we describe some of the technical and analytical aspects of the impact of deregulation in the U.S. These are matters which we believe have not been addressed adequately elsewhere. Here we simply summarize the main results:

- U.S. load factors seem to have increased since deregulation, on average. (They fell off with the recession but are still greater than those of previous recessions). As the local service carriers have added long stage and higher density routes, their load factors have risen toward those of the larger trunks.

- Charter carriers must convert to scheduled service. Charter flights are a product of regulation. They serve market niches which the regulatory authorities had prevented scheduled carriers from serving -- such as low fare vacation markets. Former U.S. charter airlines have become scheduled airlines.
- Freight has decreased in importance for passenger carriers (from 9% to 6% of revenues). Specialized air express carriers, such as Federal Express have emerged.
- There appears to be some synergy between regional/feeder and trans-continental routes. Similarly there may be synergy between trans-continental and international routes.
- The feed from third level carriers has been important to the trunk and local service carriers. Nevertheless, no attempt has been made to merge a third level carrier into a large carrier. This suggests there must be some cost savings in keeping the two types of services separate.
- Since deregulation almost all air carriers have adopted hub and spoke route networks. There are two types of hubs. The "complexing" type of hub coordinates batches of arrivals and departures to provide passengers with good service. Since resources can be idle for long periods, it is expensive to operate. A "point-to-point" hub operates at low cost on a continuous basis. It is suitable only for markets where service levels are not as important as price.
- The U.S. airline industry has not increased in concentration since deregulation. That is, the market shares of the largest carriers have not increased individually or in total. There has been strong growth of the smaller carriers: the local service carriers, former intra-state carriers, commuter carriers, and several totally new jet carriers.
- Annual productivity growth has increased from 2.8% to 5.1% since deregulation. The increase has been larger for the smaller local service carriers than the trunk carriers. Much of this increase in growth is due to increasing traffic density. Reductions in additions to capital stock has been another contributing factor.

C. Regulatory Reform in Chile

Chile is a country with roughly half the population of Canada. Its air market, however, is only 1/25 that of Canada. Chile has a government-owned airline, LAN-Chile, which had captured 75% of the domestic market. Its other jet carrier, Ladeco, was privately owned by a large conglomerate.

In 1979 Chile totally deregulated its domestic air transport system. Fares, entry into routes, exit from routes, and capacity offered were no longer regulated. The country chose to maintain its ownership of LAN-Chile and to continue providing it with substantial subsidies to cover high losses. As with the United States, it has been difficult to sort out the effects of domestic deregulation of air transport from the effects of a simultaneous economic contraction. (Real gross domestic product has fallen by over 16% in Chile, compared with the 2% contraction in the recent U.S. recession).

Appendix B of this report contains a more detailed discussion of Chile's experience with regulatory reform. Here we make only brief comments. Some of the items need careful interpretation and we urge readers to consult the more detailed discussion.

- Traffic: The annual rate of increase in total domestic passengers increased from 4.3% in the years prior to 1979 to 11.4% from 1979-1982. In 1983, the effects of the severe economic contraction gripped the industry and the 1979-1983 annual growth in traffic was -1.3%.

- Market Share: LAN-Chile's roughly 73% market share fell to 30% in terms of passengers carried and 45% in terms of revenue passenger kilometers. The difference is explained by the fact LAN-Chile's remaining routes have very long stages.
- Fares: Fare increases were 20% per year before deregulation and 14% after. This represented constant real rates before deregulation and falling real fares after. Fares jumped immediately after deregulation and then stabilized.
- Entry: No new passenger jet carriers have appeared as yet. Fast Air, an all-cargo jet carrier has captured 6.5% of total industry revenues. Before deregulation there were 40 third level carriers. At the end of 1983 there were 83.
- Employment: Employment at Ladeco increased from 220 to 481. At LAN-Chile, employees declined from 2812 to 1487. This severe drop was the continuation of a trend at LAN-Chile that began well before deregulation. When the current military regime took power LAN-Chile had 4,800 employees. By 1975, this fell to 3,264 and further fell to 2,812 in 1978, the year before deregulation. We have no employment data for Fast Air which is a third level carrier.

- Service to Small and Isolated Communities: Like Canada, Chile has many communities for which air transport is the only viable year-round transportation link. Before deregulation 30 communities had scheduled service from either LAN-Chile or Ladeco. Afterwards, this fell to only 13. This dramatic decline does not represent the complete picture. Many scheduled services were operated only weekly, or less often. Since deregulation, third level air taxis have filled the void. The CAB of Chile claims that the net result has been an improvement in air service at small communities, although they concede that there were transitional interruptions in the first year. We have no direct evidence to confirm or deny these claims.
- Profits: LAN-Chile has incurred substantial losses since deregulation. In 1981, it lost US\$35 million and in 1982 \$30 million (on a revenue base of \$140 million). These losses, at least in part, are continuations of a long history of losses financed by the government. In 1972, for example, it had a \$12 million loss. Ladeco had a \$3 million net loss in 1978, \$1 million profit in 1981 and a \$10 million loss in 1982. The latter was associated with an aircraft purchase. In 1982 its operating profits were \$6 million.

- Prospects: Employees at LAN-Chile have been pushing for re-regulation. A U.S. consultant hired to assess LAN-Chile's situation recommended re-regulation. The CAB of Chile views deregulation as being a net success in Chile. The CAB has indicated that no changes in Chile's air transport laws are being considered at present.

D. Regulatory Reform in New Zealand's Air Transport

New Zealand, with a population of 3.4 million, is considerably smaller than Canada. Nevertheless, air transport plays a major role in New Zealand's economic development. As it has no land link to any other country, air transport is the only effective passenger transportation to the rest of the world. In addition, the country itself consists of several islands. The two main islands, North Island and South Island, are separated by the Cook Strait. As can be seen, aviation plays an essential role in both the domestic and international transportation of New Zealand. In 1983, New Zealand passed legislation providing for a fast phase-in of deregulation.

In 1945 the government of New Zealand, through the New Zealand National Airways Act, established the National Airways Corporation (NAC) to meet the domestic air transport needs of the people of New Zealand. NAC was a government owned airline formed by the acquisition of three existing private operators. It commenced services in 1947. By 1948 it had a monopoly on domestic air routes.

International air transport for New Zealand began with the formation in April, 1940, of Tasman Empire Airways Limited (TEAL). TEAL was a joint

venture of Imperial Airways of the United Kingdom, Qantas of Australia and Union Airways of New Zealand. TEAL was registered in New Zealand. However, by 1960 New Zealand realized that its foreign policy and foreign transportation needs required it to have its own airline. For example, New Zealand wished to offer traffic rights to other carriers across the Tasman Sea (from Australia) in exchange for landing rights in other countries. Australia, however, wished to maintain an existing duopoly across the Tasman Sea. As a result, in 1961 the New Zealand government purchased the Australian shares in TEAL. The name of TEAL was changed to Air New Zealand.

In 1971, the government of New Zealand issued new objectives for NAC requiring it to satisfy all substantial categories of demand for air services, and for the first time, requiring it to achieve and maintain a profitable operation. A policy review in 1975, "Civil Aviation in New Zealand", stated that the corporation's principal objective should be to satisfy legitimate consumer demands at the lowest possible economic cost commensurate with the necessary standards of safety and service. The review went on to state that privately owned and operated services on internal air routes could co-exist with NAC. In 1978 NAC and Air New Zealand were merged into one carrier bearing the name Air New Zealand. Regulation of air transport in New Zealand was carried out by the Air Services Licensing Authority (ASLA).

Until 1983 regulation of air transport in New Zealand was all extensive. It covered pricing, licensing of carriers, licensing of routes, capacity and aircraft type. Regulation extended to all levels of air service including crop dusting, air taxi services, etc.

In November 1982, the new "Domestic Air Service Policy" was tabled in New Zealand. This policy provided for a phased move toward deregulation of domestic air transport. The focus of the new policy has been termed as "qualitative regulation of air service". Under the new law, the government no longer regulates price, route entry, capacity or type of aircraft. In its place the government strictly regulates the licensing for any operation of air carriers. This licensing is similar to the concept of fit, willing and able as used in the United States. Safety is of paramount concern to the licensing authority. However, additional attention is placed on a carrier's finances and their balance sheet. Failure to achieve financial or safety standards can result in a revocation of an air carriers' license at any time.

Deregulation of air transport in New Zealand occurred with the 1983 passage of the Air Services Licensing Act. The Act provided for a two phase implementation of deregulation. Phase one became effective December 1, 1983. It provided four months during which no new entry into the industry would occur. This was intended to allow a period of adjustment for existing carriers without the immediate threat of new entry. During phase one existing carriers were allowed to expand networks and alter prices without having to request permission from the ASLA. Phase two began on April 1, 1984. On that date anyone was allowed to operate air services within New Zealand if they could meet the criterion for an operating license.

In both phases the definition of what constitutes air transport has been changed. Former categories of air transport licenses such as sche-

duled, non-scheduled, taxi, air charter, etc. disappear. In the new policy there are only two categories of air service. These are "air transport" (which applies to most services) and "area work", the latter being for things such as crop dusting. There is no longer any distinction on licenses between fixed versus rotary-wing aircraft. Licenses awarded under both categories have no expiration date. Licenses, however, can be revoked by the Air Services Licensing Authority of New Zealand for any violation of the required terms and conditions of the licenses.

There are three conditions for receiving a license. The first condition is demonstrating that the proposed air service is likely to be carried out in a safe and reliable manner. The second requires that insurance be obtained by the carrier. Third is a condition restricting foreign ownership of the air carrier to a maximum of 25%. In making a determination as to whether service will be performed in a safe and reliable manner the air services licensing authority will pay particular attention to the following:

- A. Whether or not the applicant company has an adequate debt to equity ratio,
- B. Whether or not the Secretary for Transport is satisfied that the proposed air service will be carried out in a safe manner, and
- C. Whether or not the applicant has sufficient relevant management experience given the proposed scale of operations.

The Act specifically states that the potential of the market to support the level of service anticipated by the applicant is not to be a consideration in awarding the license to the carrier. Further, the license can be revoked at any time for failure to meet the service conditions.

Under the new policy air carriers are free to abandon existing routes or points provided 21 days notice is given to the air services licensing authority. Fraser M. Colman, Minister of Civil Aviation and Meteorological Services, conveyed to us that as of January 1985, only one air carrier has received a new license. This air carrier will operate tourist routes using two DeHavilland - 7 aircraft.

Section 29 of the new Act provides for penalties should an air carrier set its fares or conditions of service in a manner intended to eliminate or seriously damage the business of a fair competitor or to prevent its entry. Guidelines are given as to what constitutes an unfair practice.³ For example, "... if a dominant licensee significantly lowers his price for an air service below his price level or below his prices for equivalent services elsewhere, thereby driving out competition in a particular market, and then raises his price to his original level, ASLA may subject him to a review under this clause. On the other hand, if a dominant licensee merely lowers his price in response to competition in a way that is reasonable having regard to the behaviour of the competitor, he is not likely to be subjected to a review." Penalties are provided for if violations occur, and violators can have government determined fares imposed upon them.

In summary, the new air transport policy in New Zealand has resulted in complete deregulation of the industry. Emphasis now is placed on the fitness of carriers to provide service. Fitness is defined as encompassing a safety factor as well as financial and managerial fitness. The government no longer regulates fares, routes, capacity or type of aircraft. The new policy continues the existence of the state owned air carrier, Air New

Zealand, which continues to provide domestic and international services. This carrier continues to dominate domestic and international services in New Zealand. Air New Zealand does not, however, operate a complete monopoly. It has had some competition in the past several years, particularly on important routes across Cook Strait between North and South Islands.

Notes to Chapter 7

1. For recent treatments see Bailey, Graham and Kaplan (1985) and Meyer and Oster (1984).
2. For a good discussion of the evolution of deregulation, see Meyer and Oster (1981). Bailey, Graham and Kaplan (1985) provide the most comprehensive and up to date description of deregulation's impact. Bailey and Baumol (1984) discuss deregulation in the context of the economic theory of contestable markets. The latter is especially important as the authors observe that carrier behavior, at least during the transition to deregulation, was more responsive in markets with actual competition. This is somewhat in contrast to the pure theory of contestable markets which states that the threat of competition is sufficient to induce desirable behavior.
3. See "Understanding the Air Services Licensing Act of 1983: A Guide for All Those Offering or Intending to Offer Air Services for Hire or Reward", Ministry of Transport, Government of New Zealand.

Chapter 8: Cost Simulations

A. Introduction

In this chapter we describe the simulation of industry costs under alternative policy regimes. The vehicle for the simulations is the cost function we estimated using data for individual Canadian air carriers for the years 1964 - 1981. This cost function was described in Chapter 5.

Since we are using the cost models estimated from historical data (1964-1981), the simulated costs will reflect only the cost efficiencies that can be achieved through changes in the level and mix of outputs, network variables, and input prices. Production technology is held constant. In other words, the simulated costs would not reflect the gains in cost efficiency due to fundamental changes in airline production technology. An example of a fundamental change would be relaxation of overly restrictive work rules in union contracts. The impact of regulatory changes on cost efficiency due to such fundamental changes in production technology will be discussed in section 8.D.

We point out that here we are simulating the costs of only the two transcontinental and four regional carriers which existed in 1981. The simulation results do not include the gains in cost efficiency by other carriers (Wardair and local service carriers) which one might expect to participate more vigorously in the transcontinental and regional routes. We do not distinguish among the regional carriers in the cost simulations as we have modified all carriers in the same way. To obtain an accurate assessment of how gains and losses will be distributed among carriers, we

require more detailed information on the demand side, specifically route data.

In section B we describe the variables required for the simulations. In section C we describe the four alternative regulatory policies: Status Quo (pre-May 10th, 1984), May 10th, 1984 Liberalization, Advanced Liberalization and Deregulation. For each of the policy scenarios to be evaluated we state the values of the variables which we believe will prevail under such a policy.

The use of a cost function estimated from the regulation era allows us only to identify how costs change as we move from one point on the cost function to another. It does not provide us with a means for assessing how the cost relation might shift under deregulation. Thus simulations using an estimated Canadian cost function allow us only to identify one of the two types of changes in costs that can occur. Fortunately, we can look to the U.S. experience with deregulation to obtain an indication as to how Canadian costs might shift in a deregulated environment. Caves, Christensen and Tretheway (1985) estimated a U.S. cost function that allowed for identification of the shift. In section D we examine this U.S. evidence.

Section E describes the results of the cost simulations for the Canadian airline industry. In section F and G we investigate effects of changes in policy toward Air Canada; including privatization and breakup. In sections H and I we simulate alternative structures for the industry. Finally in section J we look at the pre 1984 Regional Carrier Policy.

B. Description of Simulation Variables

Table 8-1 contains a list of the variables used in the variable cost model. The model requires data for each carrier. For each we need to know the levels of three types of outputs, prices for three factors of production, real value of capital stock, and some fundamental descriptions of the network.

Simulations, like any forecasting or planning tool, are subject to some element of uncertainty. The analyst attempts to minimize that uncertainty. One type of uncertainty is unavoidable: uncertainty as to how carriers would actually behave under alternative policies. Until carriers are actually placed in such an environment we will not know their behaviour with certainty. We use the model to predict their behaviour based on economic decision making.

A second element of uncertainty is due to errors in forecasting the future - with or without a change in policy. Although our model only requires forecasts of carrier outputs etc., and not forecasts of national income, inflation, etc., the latter are implicit in the former. In conducting our simulations we need to choose a year. Ideally one would attempt to simulate what alternative policies would look like in the future, i.e. in 1985, 1986, etc. This, however, would introduce the second type of uncertainty.

We have adopted the approach of using 1981 as the year for simulation. This is the most recent year for which we have been able to obtain complete

Variables Used in Canadian Cost Model
(Variable Cost Model)

For each carrier, the following items are needed:

OUTPUTS

Revenue passenger kilometers-schedule services

Revenue tonne kilometers-freight services (scheduled and charter)

Revenue tonne kilometers-charter services

INPUT PRICES

Labour price (Index of 5 types of labour)

Fuel price (average price per BTU)

Price of "other" inputs (excludes labour, fuel, ground property and equipment, flight equipment)

OTHER VARIABLES

Real stock of capital (flight and ground capital)

Scheduled passenger load factor

Average Stage Length

Number of Points served

data. By using historical data for 1981 we have defined with certainty the status quo. We now only need to ask questions such as: "What would the variables in Table 8-1 look like if in 1981 we had the May 10th, 1984 policy?" We can thus concentrate on how the policy in question would have changed the Table 8-1 variables in 1981. We do not need to speculate on the levels of the variables in future years. When evaluating alternative policies the paramount consideration is how things change.

C. Description of Regulatory Policy Scenarios

In chapter 3 we described in detail how we define each of the four regulatory policies we will investigate. Here, for the sake of continuity, we briefly summarize each policy. We then indicate the specific values that have been chosen for the variables for that policy. Actual simulation results are discussed in section E, below.

Regulatory Policy 1: Status Quo (Pre May 10th, 1984 policy)

The regulatory policy which existed prior to the New Canadian Air Policy of May 10th, 1984 may be summarized as follows:

1. Entry and exit were regulated and carriers were required to meet PCN (public convenience and necessity) criterion for any change.
2. The Regional Carrier Policy confined the Regionals to their respective geographical regions, and discouraged competition between the Regionals and the transcontinental carriers.
3. For many route licences, capacity, type of aircraft, stop-over conditions and frequency of service were stipulated.
4. CTC approval was required for any fare changes, including discount fares. For regular fares, Air Canada's distance-based fare formula was accepted by the CTC and other carriers.

By confining the Regional carriers primarily to short haul, medium to low density routes, the policy encouraged the Regionals to overexpand in charter markets far beyond the efficient mix between scheduled and charter services. It also helped maintain Air Canada and CP Air's monopoly power on transcontinental routes. Labour input prices were kept high at least in the sense that some inefficient work rules were tolerated.

For simulation purposes, all variables are given actual 1981 values. Since the pre-May 10th regulatory policy (status quo) forms the reference point for the other policies of our cost simulations, in Table 8-2 we summarize by categories the 1981 output levels and average revenue per RTK (revenue tonne kilometer) for each of the six transcontinental and regional carriers. From the table, we note that the two transcontinental carriers produced relatively small proportions of their total outputs from charter services, compared to the regional carriers (except EPA). Charter services accounted for about 28% of total outputs for the regionals.

Policy 2: May 10th Liberalization

Through a Ministerial policy statement, Mr. Axworthy introduced the following substantial changes to airline regulation in southern Canada.

1. The merits of competition should be given a heavier weight in judging PCN for entry licensing.
2. The Regional Carrier Policy is abolished, regionals may apply for licenses for routes outside of their traditional regions.
3. Removal of all restrictions on route licenses. Carriers are encouraged to apply for consolidation of their licenses.
4. Eventually (within two years) CTC control on decreases in air fares are to be ended. Fare increases are to be restricted to within the growth of an input price index which excludes labour input.

Table 8-2

1981 Output and Average Revenue By Output Type
(Revenue Shares in parenthesis)

Carrier	Scheduled Passenger		Scheduled Freight		Charter		Total RT and average revenue per RTK
	output in million RTK	average revenue per RTK	output in million RTK	average revenue per RTK	output in million RTK	average revenue per RTK	
AC	2044 (76%)	\$0.892	569 (21%)	\$0.431	68 (3%)	\$0.679	2681 \$0.789/R
CP	877 (73%)	\$0.727	224 (19%)	\$0.384	96 (8%)	\$0.703	1197 \$0.661/R
IWA	151 (59%)	\$1.494	23 (9%)	\$1.048	80 (32%)	\$0.65	254
QA	23 (56%)	\$1.586	2 (5%)	\$1.495	16 (39%)	\$2.54* (1980:1.04)	41
EPA	60 (85%)	\$1.218	7 (10%)	\$1.382	4 (6%)	\$0.714	71
NA	58 (50%)	\$1.251	24 (20%)	\$0.782	35 (30%)	\$0.902	117
Total for Regional Carriers	292 (60%)	\$1.396	56 (12%)	\$0.992	135 (28%)	\$0.763	483 1.17/R
Total Industry	3213 (74%)	\$0.893	849 (20%)	\$0.456	299 (7%)	\$0.725	4361 \$0.796/R

* Because Statistics Canada changes its reporting statistics in 1981, it was not possible to determine average revenue per RTK precisely for Quebecair. This figure is approximated using past trends of all available statistics. For this reason, we used the average revenue \$1.04/RTK in computing the industry and the regional carrier means.

Although it is impossible to precisely pin point effects of the May 10th policy on the key variables included in the airline cost function, without a fully developed Canadian demand model, we attempted to put some numbers on them, relative to what actually happened in 1981. Table 8-3 contains the values of variables used in the May 10th policy simulation. Below, we describe our reasons for choosing those particular figures.

First of all, note that we treat all the regional carriers the same in the simulation. While the May 10th policy will affect each carrier differently, we wanted to concentrate on the broad impacts of policy in our analysis. Nevertheless our cost simulation program can be easily modified to investigate carrier specific impacts.

Air Canada

With regard to Air Canada, we felt the May 10th policy would change little. Clearly, the policy was not intended to provide any growth potential for the crown carrier in domestic markets, thus we froze its level of output and its output mix. The policy also provided little opportunity for dropping communities (except when new entry occurs). Thus, we made no change in the number of cities it served. With no change in output or cities served, no justification was present for changing stage length.

In this and in all other policies we assumed average load factors would not change. We base this on the observation that load factors on deregulated U.S. routes still have not caught up to those historically prevailing in Canada. This should not be too surprising given that Canada, due to regulation of capacity offered, did not experience the scheduling

Table 8-3

Variables Used in the May 10th Policy Simulation
(Relative to the Base Case)

	Air Canada	CP Air	Regionals
Total output	no change	3% increase	10% increase
# of points	no change	no change	no change
Output mix:			
Passenger	no change	no change	balance to make 10% increase in total output
Charter	no change	no change	10% absolute reduction
Freight	no change	no change	no change in absolute level
Stage length	no change	no change	10% increase
Load factor	no change	no change	no change
Labour prices	no change	5% reduction	no change
Capital	10% reduction	no change	5% reduction

rivalry that occurred in the U.S. That rivalry resulted in low load factors in the U.S. during the regulated era.

In our view, the May 10th policy will not encourage significant entry into Air Canada's markets by new non-union carriers. Thus, we see an inadequate amount of pressure on the carrier to seek to lower labour prices in a major way. (We assume all carriers are price takers for fuel, capital and other inputs). The instructions in the May 10th policy to Air Canada to achieve private sector financial standards, should it desire new equity capital, could, we speculate, induce Air Canada to reduce its capital stock. Sale of a few idle 747's, a plane type not well suited to medium density deregulated Canadian markets, could reduce its capital stock by say 10%.

CP Air

For CP Air we see some opportunity for output growth and we have assigned it the value of 3%. Again, there is little in the policy that would lead to dropping service at many cities so we have held these constant. The only other change we envision for CP Air is a 5% reduction in real wages. The justification for this is twofold. First, we have already observed CP holding or reducing nominal wages and obtaining some work rule concessions. Second, part of the May 10th policy anticipates an eventual move to complete deregulation. CP, in such an environment, is likely to experience pressures on all fronts: in its regional markets in the West (from PWA and third level carriers), on transcontinental runs (from Air Canada, Wardair and potentially PWA), and possibly in the Pacific and other

overseas markets. The latter pressure is due to the inevitable expansion of foreign carriers in the 1980s and 1990s as well as to the fact that the May 10th policy largely confines Air Canada's growth in international markets; perhaps at the expense of CP. In anticipation of such developments, CP may wish to negotiate lower wages now rather than later.

As we find CP already to be relatively efficient with regards to capital use we foresee no change in its capital stock under this policy.

Regionals

The regional carriers, via removal of license restrictions, have the greatest opportunity for output growth under the May 10th policy. Thus we assign a 10% growth in total output. No net changes in the number of cities they serve is foreseen. Thus, they have some opportunity to reap cost reductions from exploiting economies of density. The new possibilities for scheduled service for the regionals lead us to believe they will reduce service offerings in charter markets (by 10%). Freight service should stay the same.

Because output growth is likely to occur on routes with longer stages, we expect a 10% increase in the regional carriers' average stage length.¹ Because of the higher degree of competition, we expect the regionals to reduce their excess capital, particularly due to reducing the need for aircraft specifically to serve charter markets. Since we found that the regionals had less excess capital than Air Canada, we have assigned them only a 5% reduction in capital stock.

Policy 3: Advanced Liberalisation

The important elements of the Advanced Liberalization Policy that affect our simulations are as follows:

- Greater exit freedom accompanied by a small and isolated community subsidy program.
- Unlimited entry by third level carriers in all markets.
- Freedom to raise fares in short haul markets.

Under the Advanced Liberalization Policy, we expect that new third level carriers using small aircraft would exert considerable pressure on the regional carriers. As a result, the regionals would have to streamline labour input prices, reduce their charter services and excess capacity, and participate selectively in some medium to long haul high density routes. This policy would in turn put the regionals in a very vulnerable situation. The competitive response of the regionals would create some additional pressures on Air Canada and CP Air, forcing them to reduce somewhat their input prices and excess capacity. Our best estimates as to what would have happened to the key variables in 1981 are summarized in Table 8-4.

We see some opportunity under this policy for Air Canada to drop service at some small communities, being replaced by regional or third level carriers. The regionals in turn are likely to drop their smallest points, being replaced by third level carriers. This drop by Air Canada and the regionals of their smallest communities is likely to increase the stage length of each. CP Air, with relatively less service at smaller communities, is likely to have no net change.

Variables Used in the Advanced Liberalization Policy Simulation

	Air Canada	CP Air	Regionals
Total output	5% reduction	no change	10% increase
# of points	10% reduction	no change	10% reduction
Output mix:	no change	no change	
Charter			20% absolute reduction
Freight			same in absolute
Passenger			whatever is necessary to make 10% increase in total output
Stage length	10% increase	no change	15% increase
Load factor	no change	no change	no change
Labour price	5% reduction	10% reduction	10% reduction
Capital stock	15% reduction	5% reduction	10% reduction

One consequence of this policy is that total output by these 6 carriers may be lower than at present. (This is a consequence of the dominant market share of Air Canada.) New third level carriers and perhaps Wardair may capture much of this reduction. However, quality adjusted output may go up, as the regionals move into scheduled markets and drop charter services.

Policy 4: Deregulation

Under deregulation, there could be major changes in the structure of the industry, route and network structures of carriers, and input prices. Air Canada is expected to contract its domestic services considerably, to seek opportunities internationally, and to streamline their labour input prices and excess capacity. Under deregulation, the regionals by channeling their existing feed traffic onto new longer haul routes, are expected to gain most. CP Air is expected to gain a little as well, due to its reductions in costs. Wardair and a new jet carrier or two, if they choose markets to enter, could achieve some gains as well.

Again our best estimates on what would have happened under deregulation to the variables in our cost model are summarized in Table 8-5.

A Note on Industry Structure

In all of the simulations we maintain the current structure of the industry: Air Canada, CP Air and four regionals.¹ Industry concentration decreases as we moved toward deregulation since Air Canada contracts somewhat in domestic markets and the regionals grow. In addition there should

Table 8-5

Variables Used in the Deregulation Policy Simulation

	Air Canada	CP Air	Regionals
Total output	15% decrease	10% increase	30% increase
# of points	15% decrease	no change	10% decrease
Output mix:	no change	change	change
Charter		50% reduction	5% of output
Freight		no change	same in absolute
Passenger		balance to make total output grow by 10%	balance to make total output grow by 30%
Stage length	30% increase	10% increase	30% increase
Load factor	no change	no change	no change
Labour price	15% decrease	15% decrease	20% decrease
Capital stock	35% reduction	10% reduction	15% reduction

be some transfer of outputs to third level carriers, possibly Wardair, and perhaps a new jet carrier or two. In sections H and I, below, we investigate effects of changing the industry's structure.

D. Shifts in U.S. Costs After Deregulation

As described in the introduction to this chapter, regulatory reform can lead to two economic changes. First, firms can move to more efficient points on the production or cost function. Second, the function itself can shift. An example of the former type of change would be a movement under deregulation to a higher proportion of scheduled passenger services if the previous regulatory regime had put limits on the amount of scheduled services a carrier could offer. An example of a cost function shift would be if deregulation leads to new ways of allocating tasks to employees (perhaps by elimination of restrictive work rules) such that fewer employees are now needed (at the same wage rate) to provide a given amount of service.

In the policy scenarios described in section C above, we outlined changes of the first type: movement to a more efficient production "point" -- a point consistent with existing technology and procedures of conducting an airline business in Canada. We also need to investigate whether the second, "production shift", type of change is likely to occur in a deregulated Canadian environment. Rather than simply speculate about this hypothetical question we turn to the U.S. experience with deregulation to see what actually happened there.

Appendix C of this report describes in detail the evidence from the U.S. There is some evidence that changes in technology have been "labour

saving" in the U.S. since deregulation. But with the limited amount of data available, the statistical evidence is weak, at best, that cost shifts have occurred. There is evidence that changes in technology have been "labour saving" in the U.S. since deregulation. Given the relatively weak nature of the evidence, we have decided to err on the side of conservatism and have not attributed any cost shift type of cost savings to our simulations of deregulation in Canada.

E. Results of Regulatory Policy Cost Simulations

The variable cost model was used to simulate the total cost of each carrier under the four alternative regulatory policies outlined above. The results are summarized in Table 8-6. For the purpose of comparing the cost efficiencies of alternative policies, we compute a quality adjusted unit cost reduction factor.²

1. May 10th Liberalization Policy: Cost efficiency of the industry would improve by 4.4% as compared to the status quo. Under this policy, the cost efficiency of Air Canada, CP Air and the regional carriers is expected to increase 4.3%, 2.5% and 6.3% respectively. Total costs fall for Air Canada. CP Air and the regionals are expected to experience increases in total costs, but these are more than offset by output increases resulting in unit cost reductions. Total industry output is expected to increase roughly 2% under the May 10th policy.

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Table 8-6

Cost Simulation Results for Alternative Regulatory Policies

Regulatory Policy	Industry	Air Canada	CP Air	Regionals
(A) Status Quo (Pre-May 10th)				
total cost	\$3493	\$2138	\$ 779	\$ 576
output (RTK):	4360	2680	1200	480
passenger	74%	76%	73%	60%
freight	20%	21%	19%	12%
charter	7%	3%	8%	28%
average revenue	\$0.80/RTK	\$0.79/RTK	\$0.66/RTK	\$1.17/RTK
output quality index	1.0	1.0	1.0	1.0
(B) May 10th Liberalization				
total cost	\$3468	\$2069	\$ 783	\$ 616
(% change)	-0.8%	-4.3%	+0.5%	+6.9%
output (RTK):	4443	2680	1236	527
(% change)	+2.3%	0%	+3%	+10%
passenger	74%	76%	73%	66%
freight	19%	21%	19%	11%
charter	7%	3%	8%	23%
average revenue	\$0.80/RTK	\$0.79/RTK	\$0.66/RTK	\$1.21/RTK
output quality index	1.003	1.0	1.0	1.032
quality-adjusted unit cost reduction	4.4%	4.3%	2.5%	6.3%

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Table 8-6 (continued)

Regulatory Policy	Industry	Air Canada	CP Air	Regionals
(C) Advanced Liberalization				
total cost	\$3242	\$1912	\$ 756	\$ 574
(% change)	-7.2%	-10.5%	-3%	-0.4%
output (RTK):	4273	2546	1200	527
(% change)	-1.4%	-5%	0%	+10%
passenger	75%	76%	73%	69%
freight	19%	21%	19%	11%
charter	6%	3%	8%	21%
average revenue	\$0.80/RTK	\$0.79/RTK	\$0.66/RTK	\$1.22/RTK
output quality index	1.004	1.0	1.0	1.046
quality-adjusted unit cost reduction	6.5%	5.5%	3.0%	15.0%
(D) Deregulation				
total cost	\$3196	\$1621	\$ 819	\$ 756
(% change)	-8.6%	-24.2%	+5.1%	+31%
output (RTK):	4221	2278	1320	623
(% change)	-2.0%	-15%	+10%	+30%
passenger	78%	76%	77%	86%
freight	19%	21%	19%	9%
charter	3%	3%	4%	5%
average revenue	\$0.805/RTK	\$0.79/RTK	\$0.66/RTK	\$1.33/RTK
output quality index	1.017	1.0	1.001	1.135
quality-adjusted unit cost reduction	8.8%	9.2%	5%	12.5%

2. Advanced Liberalization Policy: Cost efficiency is expected to increase to 6.5% compared to the status quo. This is an improvement of 2.1% over the May 10th policy. Air Canada, CP Air and the regionals are expected to increase their efficiency by 5.5%, 3.0% and 15.0% respectively relative to the status quo. Total "industry" (i.e. the 6 carriers in our study) output falls by 2%, Air Canada's output falls by 5%. Traffic increases are expected for third level carriers and possibly Wardair such that net output for all Canadian air carriers goes up by 6.2%.

3. Deregulation: This policy is expected to increase cost efficiency by about 8.8% compared to the status quo. This is an improvement of 4.4% over the May 10th policy and 2.3% over advanced deregulation. Air Canada, CP Air and the regionals would improve their cost efficiency by 9.2%, 5.0% and 12.5% respectively relative to the status quo. Output for the 6 air carriers falls by 3.2%, due to Air Canada's drop of 15%. While substantial gains are made by CP Air and the regionals, they do not offset the drop of Air Canada. Net output for all Canadian air carriers is expected to increase by 7.7%. The difference will be captured by third level carriers, perhaps Wardair and perhaps a new jet air carrier or two.

We remind readers that in these simulations we have maintained the status of Air Canada as it is today. Specifically, under the May 10th, 1984 policy, Air Canada has been constrained in its ability to act competitively in Canadian airline markets. Thus we feel that other carriers will

be able to grow at the expense of the crown carrier. In the next two sections we simulate results of changes in Air Canada's status.

F. Description of Crown Carrier Policy Scenarios

In simulating the Crown Carrier policies, we fix the regulatory policy at the May 10th policy in order to isolate the effect of changes in Crown Carrier policies. For clarity, we also assume that, except for the change in Air Canada's labour input price, the policy options for Air Canada will not affect other carriers' cost structures, traffic levels, etc.

In Chapter 3 we described in detail how we define each of the four policies toward Air Canada which we will simulate. We summarize each policy here for continuity:

- (a) Pre May 10th Air Canada policy: Air Canada had reasonable access to public funds for its capital needs without going through a rigorous private sector investment test.
- (b) May 10th policy: Continued 100% public ownership with access to additional public funds only when the private sector's criterion is met. Air Canada is constrained in its ability to act competitively in domestic markets.
- (c) Privatization Without Breakup: It is assumed the new owners exercise control over the carrier.
- (d.1) Privatization in Two Pieces: Each piece has a regional network and transcontinental rights.
- (d.2) Privatization in Three Pieces: Each piece has a regional network and transcontinental rights.

In order to simulate the cost implications of alternative options, we need to conjecture what would happen to key variables in the cost function under each of the alternative options. In each of the scenarios we construct, we hold regulatory policy at the May 10th, 1984 configuration. A summary of the variable changes are presented in Table 8-7. These present the changes relative to the values which we would have observed if the May 10th regulatory and the pre-May 10th crown carrier policies prevailed.

May 10th Air Canada Policy

Under this policy, there is no apparent reason why Air Canada should change its current output, network, and input prices. Because of the acid test on access to the public till, we believe this policy will induce it to reduce its excess capital somewhat, say by 10%.

Privatization Without Breakup

For our simulation of this option, we assume that the owners have effective control over the airline. We further assume restrictions on Air Canada's ability to compete in markets are reduced. The new owners are likely to introduce the following changes:

- drop some cities with low traffic volume. (Assumed here to be a 10% reduction, about 6 to 7 cities).
- reduce excess capital substantially, say by 25%. This is reasonable in that our analysis indicates Air Canada has substantial excess capital stock.

Variables Used in Air Canada Policy Simulations

	May 10th, 1984 Air Canada Policy	Privatization w/o Breakup	Privatization in Two Pieces (each piece)	Privatization in Three Pieces (each piece)
Output	no change	no change	1/2	1/3
Output mix	no change	no change	no change	no change
Points	no change	10% reduction	60% of total	46% of total
Stage length	no change	10% increase	no change	no change
Load factor	no change	no change	no change	no change
Input prices (labour)	no change	5% reduction*	5% reduction*	5% reduction*
Capital	10% reduction	25% reduction	37.5% of total	25% of total

*Other carriers also reduce labour input price by 5%.

Note: May 10th, 1984 regulatory policy assumed to prevail.

- seek reductions in labour input costs by about 5%. This would also make all other carriers reduce their labour input costs by 5% as well.

Privatization With Breakup Into Two Pieces

For this option, we assume that each piece will have a regional network feeding traffic to its transcontinental routes. The carrier's existing total output would be divided into two. Number of points served by each piece would be about 60% of the current total as there should be some overlap in points between the two pieces.

Capital stock for each piece is likely to be about 37.5% of the current capital stock, ie. a total cut of about 25% consistent with privatization without breakup. Labour input prices are likely to decrease by about 5%. This will also make other carriers reduce their labour costs by the same percentage. No other changes are likely to occur purely because of privatization in two pieces.

Privatization With Breakup Into Three Pieces

We also assume here that each piece will have a regional network and transcontinental routes. We believe that the breakup into three pieces would not change total output or capital stock in a measurable way over and above the previously discussed breakup into two pieces. Because of the expected overlap of networks, we believe the total network would be larger and hence density somewhat lower. Therefore, each piece is likely to have:

- 1/3 of the total output
- 46% of Air Canada's current points
- 25% of the current capital stock

Other variables are assumed to remain the same as in "Privatization Without Breakup".

G. Results of Crown Carrier Cost Simulations

The results of the simulations of alternative policies toward Air Canada are summarized in Table 8-8. Again, in these simulations we assumed that the regulatory policy is fixed at the May 10th policy.

As compared to the pre-May 10th Air Canada policy (a), the May 10th Air Canada policy (b) results in a cost efficiency improvement of 3.1%, a total saving of \$108 million. This occurs mainly through reducing the excess capital stock of Air Canada by applying a more rigid financial test for accessing public funds.

Privatization without breakup (c) would result in Air Canada improving its cost efficiency by 10.6%. This in turn provides incentives for CP Air and the regionals to improve their cost efficiency by 1.3% and 1.6% respectively. This amounts to a total saving of \$239 million. Here, Air Canada's cost saving comes from a significant reduction in capital stock (25% reduction), dropping 10% of its points (which increase average traffic density of its network by 10%), and reduction of labour input prices by 3%. Since Air Canada's labour input prices have served as an industry standard, the reduction of Air Canada's labour prices is likely to trigger other carriers' labour prices by the same factor.

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Table 8-8

Cost Simulation Results for Alternative Air Canada Policies
(Regulatory Policy fixed at the May 10th, 1984 Policy)

	Industry	Air Canada	CP Air	Regionals
(a) Pre May 10th Air Canada Policy (status quo)				
Output	4443	2680	1236	527
passenger	74.3%	76.2%	73.3%	66.4%
freight	19.2%	21.2%	18.7%	10.6%
charter	6.5%	2.6%	8%	23%
capital cost	\$445	\$280	\$110	\$55
total cost	\$3468	\$2069	\$783	\$616
(b) May 10th Air Canada Policy				
Changes:				
capital stock		10% reduction	no change	no change
Results:				
total cost	\$3404	\$2004	\$783	\$616
(% change)	-1.8%	-3.1%	0%	0%
(c) Privatisation without breakup				
Changes:				
output	no change	no change	no change	no change
points	-	10% reduction	-	-
stage length	-	10% increase	-	-
labour prices	5% reduction	5% reduction	5% reduction	5% reduction
capital stock		25% reduction	no change	no change
Results:				
total cost	\$3229	\$1850	\$773	\$606
(% change)	-6.9%	-10.6%	-1.3%	-1.6%

Table 8-8 (continued)

	Industry	Air Canada	CP Air	Regionals
(d.1) Privatisation in two pieces				
Changes:				
output	no change	1/2 each piece	no change	no change
points		60% each piece	no change	no change
stage length	no change	no change	no change	no change
labour prices	5% reduction	5% reduction	5% reduction	5% reduction
capital stock		37.5% of total	no change	no change
Results:				
total cost	\$3299	\$1920	\$773	\$606
(% change)	-4.9%	-7.2%	-1.3%	-1.6%
(d.2) Privatisation in three pieces				
Changes:				
output	no change	1/3 each piece	no change	no change
points		46% each piece	no change	no change
stage length	no change	no change	no change	no change
labour prices	5% reduction	5% reduction	5% reduction	5% reduction
capital stock		25% each piece	no change	no change
Results:				
total cost	\$3287	\$1908	\$773	\$606
(% change)	-5.3%	-7.8%	-1.3%	-1.6%

Privatization in two pieces (d.1) would reduce Air Canada's total cost only by 7.2% because the two new carriers must separately serve some identical points on their transcontinental routes. This reduces benefits of density economies. Total cost saving of the industry would be about \$169 million.

Privatization in three pieces (d.2) would reduce Air Canada's cost by 7.8% and the industry's cost by 5.3%. Total saving would be about \$181 million. Note there is very little difference in cost savings between a two and three way break-up.

H. Descriptions of Alternative Industry Structure Simulations

In all of the above simulations, we have maintained the current structure of the industry: Air Canada, CP Air and four regionals.³ Our cost model clearly indicates significant economies of traffic density for the regionals, and perhaps some modest economies of firm size. This might suggest an incentive for the regional carriers to merge with each other or with a transcontinental carrier. In addition, we could conceive of a breakup of Air Canada consisting of transferring some of its assets and routes to existing carriers. In this section and the next, we explore the impact of changes in structure of the domestic airline industry on cost efficiency.

We ask readers to view these simulations as being suggestive rather than definitive. A complete consideration of the structure of the Canadian airline industry requires knowledge of route specific demands, as well as knowledge of costs. Here we only look at cost impacts of a few interesting

hypothetical cases of restructuring the industry. Actual restructuring would require more detailed carrier and route specific analysis.

In order to isolate the effect of industry structure, we simulate the total cost of alternative structures under the historical regulatory and ownership status prevailing in 1981. Following are the hypothetical industry structures we consider:

Alternative (IS.1): Transfer 1/3 of Air Canada to CP Air--Case 1

- Transfer 1/3 of Air Canada's outputs and 75% of 1/3 of Air Canada's capital stock to CP Air.
- Reduce the number of points served by Air Canada by 1/3 and give 50% of the dropped points to CP Air.
- Adjust CP Air's stage length using a weighted average of its 1981 stage length and the stage length of the new outputs received from Air Canada.

Alternative (IS.2): Transfer 1/3 of Air Canada to CP Air--Case 2

Same as Alternative IS.1 except that all of the points lost by Air Canada will be picked up by CP Air.

Alternative (IS.3): Transfer 1/2 of Air Canada Equally to other 5 carriers--Case 1

- Reduce Air Canada's output by 1/2 and give an equal portion of that to each of the five other airlines.

- Air Canada's capital stock and points served are also halved. Other carriers' capital stocks are increased by 75% of 1/5 of the Air Canada reduction.
- Adjust other carriers' points and stage lengths; for stage length, use the weighted average of their existing outputs and the new outputs transferred from Air Canada.

Alternative (IS.4): Transfer 1/2 of Air Canada to other 5 carriers--Case 2

Same as Alternative (IS.3) except in this case the outputs, the points and 75% of the capital taken away from Air Canada will be distributed to the other carriers in proportion to their existing output sizes.

Alternative (IS.5): Two Carrier Policy

All regional carriers are to be merged with CP Air. The new CP Air will have:

- outputs = sum of all five carriers' outputs.
- points served = the existing CP points plus 70% of the sum of existing regional carriers' points (30% reduction reflects duplication in the points served by the five carriers).
- capital stock = 90% of the sum of the five carriers' existing capital stocks.
- stage length = weighted average of all five carriers' stage lengths.

Alternative (IS.6): Merge CP Air and EPA

In 1984, CP Air acquired control of EPA. It is reasonable to investigate whether or not an actual merger of the two firms would be more cost efficient than continuing to operate the two firms separately, as they currently do. Accordingly, we merge the data for the two carriers and perform a simulation.

We point out to readers that in forming this hypothetical case we are merely using actual 1981 outputs. One rationalization for a merger of CP and EPA may be to increase the total amount of traffic carried by the two. For example, now that CP Air has control of EPA it can hand off to EPA more of its eastbound feed in Toronto or Montreal than it did prior to 1984. Since we do not have a route specific demand model as yet, we are not able to quantify whether such an overall increase in traffic is likely or what its magnitude would be. In other words, when traffic feed is considered, a merger of CP Air and EPA could result in more favourable results (due to economies of traffic density) than our analysis shows.

I. Results of Industry Structure Simulations

The simulation results for the alternative industrial structures are presented in Table 8-9, along with the simulation of the base case (1981 actual structure) for reference. Since the level and mix of total outputs for the industry remain the same between the alternative structures simulated here, total costs of the industry can be directly compared across the

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Table 8-9

Simulation Results on Industry Structure

Alternatives	Industry	Air Canada	CP Air	Regionals
<u>*Base Case</u> (1991 Actual Structure)				
Total output (million RTK)	4360	2680	1200	480
Passenger	74%	76%	73%	60%
Freight	20%	21%	19%	12%
Charter	7%	3%	8%	28%
Points		64	33	107
Stage length (km)		1156	1417	426
Capital cost (million \$)	\$ 479	\$311	\$110	\$58
Total cost (million \$)	\$3493	\$2138	\$779	\$576
<u>Alternative IS.1</u> (Transfer 1/3 AC to CP-1)				
Total output (million RTK)	4360	1797	2082	480
Passenger	74%	76%	74%	60%
Freight	20%	21%	20%	12%
Charter	7%	3%	6%	28%
Points		43	44	107
Stage length (km)		1156	1304	426
Capital cost (million \$)	\$ 451	\$208	\$185	\$58
Total cost (million \$)	\$3145	\$1389	\$1179	\$576
% Change in TC	-10%			
<u>Alternative IS.2</u> (Transfer 1/3 AC to CP-2)				
Points		43	54	107
Stage length (km)		1156	1304	426
Total cost (million \$)	\$3201	\$1389	\$1235	\$576
% Change in TC	-8.4%			

Table 8-9 (cont'd)

Alternatives	Industry	Air Canada	CP Air	Regionals
Alternative IS.3 (Transfer 1/2 to Others-1)				
Total output (million RTK)	4360	1340	1465	1555
Passenger	74%			
Freight	20%			
Charter	7%			
Points		32	39	133
Stage length (km)		1156	1368	979
Capital cost (million \$)	\$ 438	\$156	\$132	\$150
Total cost (million \$)	\$3222	\$1001	\$922	\$1299
% Change in TC	-7.8%			
Alternative IS.4 (Transfer 1/2 AC to Others-2)				
Total output (million RTK)	4300	1340	2205	815
Passenger	74%			
Freight	20%			
Charter	7%			
Points				
Stage length (km)		1156	1295	767
Capital cost (million \$)	\$ 437	\$156	\$195	\$86
Total cost (million \$)	\$3085	\$1001	\$1279	\$805
% Change in TC	-11.7%			
Alternative IS.5 (Two carrier policy)				
Total output (million RTK)	4360	2680	1680	Merged
Passenger	74%	76%	69%	
Freight	20%	21%	17%	to
Charter	7%	3%	14%	
Load Factor		66%	58%	CP Air
Points		64	108	
Stage length (km)		1156	1198	
Capital cost (million \$)	\$ 463	\$311	\$152	
Total cost (million \$)	\$3313	\$2138	\$1175	
% Change in TC	-5.1%		-13.3%	

alternatives. In order to facilitate the comparisons, we report percentage change in total cost relative to that of the base case. The results are summarized below:

1. Alternative IS.1 (transfer 1/3 of Air Canada to CP Air with some modifications to points and capital stock level) is likely to reduce the total cost of the industry by about 10%, a cost saving of about \$350 million. This improvement in cost efficiency is achieved through:
 - moving Air Canada from its current state of slightly decreasing returns to firm size closer to the efficient size.
 - increasing traffic density for CP Air by transferring some of Air Canada's high density routes to CP Air, and by consolidating some points separately served currently by Air Canada and CP Air.
 - savings in capital cost.
2. Alternative IS.2 (essentially the same as Alternative IS.1, except that in this case CP Air is to pick up all of the points Air Canada loses) gives an 8.4% cost saving, a lower effect than Alternative IS.1. This is because the gain in traffic density by CP Air would be lower in this case compared to Alternative IS.1 (due to the larger number of points CP serves).
3. Alternative IS.3 (transfer 1/2 of Air Canada to all other carriers in equal pieces with some down-sizing of capital stock) is likely to reduce the industry's total cost by about 7.8%, a saving of \$271 million. This saving is achieved through:

- moving Air Canada closer to efficient size.
 - CP Air and the four regionals exploiting economies of traffic density,
 - moving the regionals' outputs closer to the efficient mix (since traffic acquired from Air Canada will be mostly scheduled passengers).
4. Alternative IS.4 is almost the same as Alternative IS.3 except that the 50% down-sizing of Air Canada is achieved by giving it to each airline in proportion to its current output size. This alternative is expected to reduce total industry cost by about 11.7%, a saving of \$409 million. Under this alternative, privately owned CP Air will end up being larger than the reduced Air Canada. The gain here over IS.3 is due to achieving very high density economies for CP Air. This result is consistent with that of Alternative IS.1 where CP Air acquired 1/3 of Air Canada.
5. Under Alternative IS.5, all of the four regionals are merged with CP Air, this merger is expected to save about 13.3% of the combined cost of the five carriers, or equivalently 5.1% of the total cost of the industry. This savings is achieved largely through:
- consolidation of points served thus taking advantage of unexploited economies of traffic density,
 - some reduction in capital cost through fleet scheduling improvements etc., and
 - moving the mix of the combined outputs closer to the efficient mix, as compared to those of the existing regional carriers.

6. Case (IS.6) Merger of CP Air and EPA. We compare the simulated 1981 costs between the merged firm and the two firms separately (base case) in Table 8-10. The results indicate that the merged firm would be less cost efficient than two firms separately. Total cost would increase by about 3% or \$27 million. The result is largely due to a reduction in the overall traffic density of the new, combined firm.⁴

We remind the reader that this simulation is hypothetical only. In particular, it does not consider whether there will be "demand side effects", such as keeping more traffic on the combined system. The results also indicate the caution one must use with aggregate cost models. In this case we find that summing two pieces can increase costs. This is a consequence of the historical relationships observed in the Canadian airline industry where lower costs are associated with firms with higher traffic density. Any actual merger study must use disaggregate analysis, looking at individual pieces of the air carriers, and how they fit together.

J. Simulations of Regional Carrier Policies

Description of Alternatives

In this section, we explore the impact of changing the regional carriers' output mix, output level and stage length. The following alternatives are simulated:

Alternative RC.1: 50% of each regional carrier's charter traffic is transferred to scheduled service.

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Table 8-10

Simulation Result on CP-EPA Merger*

	Base Case		Merged Firm
	CP Air	EPA	
total output (million RTK)	1197	71	1268
passenger (%)	73%	84%	74%
freight (%)	19%	10%	18%
charter (%)	8%	6%	8%
points	33	18	51
stage length (km)	1417	422	1354
capital cost (\$ million)	\$110	\$5.1	\$114.5
total cost (\$ million)	\$779	\$78	\$884
% change in total cost	-	-	+3.0%

*This simulation actually combines the carriers. CP Air is currently operating EPA as an independent entity.

Alternative RC.2: transfer each regional's charter to its scheduled service until the charter traffic becomes 5% of total revenue-tonne-kilometers (RTM).

Alternative RC.3: transfer 50% of each regional's charter traffic to scheduled service, and increase the resulting scheduled passenger service output and stage length by 50%.

Alternative RC.4: transfer each regional's current charter traffic to scheduled service until charter becomes 5% of the total, and then increase the resultant scheduled passenger output and stage length by 50%.

Since the crucial issue to investigate for regional carrier policy is effects of economies of scope (or inter-product cost relationship), our variable cost function which treats the capital stock level as exogenously determined is inappropriate to use. Therefore, for these simulations we decided to use the total cost function with hedonic output specifications.

Simulation Results

We report the simulation results in Table 8-11, and compare them with that of the base case (1981 Actual). In comparing the results, we take into account the change in traffic quality (due to changes in traffic mix), the change in magnitude of traffic (total RTK), and the change in total cost.⁵ The results reported in Table 8-11 may be summarized as follows:

1. The simulation results of Alternatives RC.1 and RC.2 indicate that merely transferring 1/2 of charter traffic to scheduled service would not improve cost efficiency (in fact there would be a slight increase in total cost of production), while the drastic transfer of charter to scheduled services (by reducing charter to 5% of total traffic) would improve cost efficiency of the regionals (by 10.6%, -- a saving of \$54 million). This result is consistent with the results we obtained in Chapter 5 where we evaluated the signs of inter-product cost relationships at each data point. It appears that the optimal charter proportion for the Canadian regional carriers is significantly lower than 14%. We believe these results are plausible. If a carrier expands its charter services to the point where the charter share of traffic becomes large enough, dedicated aircraft are required. Once this threshold is crossed, there may be some slight economies to increasing charter traffic further to get better utilization out of this dedicated capacity.

2. The simulation results for Alternatives RC.3 and RC.4 indicate:

- A significant gain in cost efficiency can be achieved by expanding the regionals' scheduled services to medium-to-long haul routes.
- Alternative RC.3 (which is the same as Alternative RC.1 except for increasing scheduled traffic and stage length by 50%) indicates a savings in quality-adjusted costs of 16.4%, or \$94 million. These savings are achieved by exploiting economies of traffic density, economies of longer stage length and by moving the mix of traffic closer to the efficient mix.

Table 8-11

Simulation Results on Regional Carrier Policies
(using total cost functions)

Simulation	Alternative	Base 1981	Alternative RC, 1	Alternative RC, 2	Alternative RC, 3	Alternative RC, 4
Total Output (in million RTK)		480	480	480	463	483
Passenger (%)		608	748	836	81.58	888
Freight (%)		128	128	128	8.58	88
Charter (%)		288	148	58	108	48
Average Revenue/RTK		91.17	81.26	91.32	91.30	81.34
Output Quality Index		1.0	1.076	1.125	1.111	1.146
Route Length		426	426	426	639	639
Points		107	107	107	107	107
Total Cost (in \$ million)		8573	8618	8584	8761	8704
% Change in TC		-	+7.88	+1.98	+22.68	+22.98
% Change in RTK		-	0	0	+38.18	+42.78
% Change in Quality Index		-	+7.68	+12.58	+11.18	+14.68
% Change in Adjusted Cost		-	+0.28	-10.68	-16.48	-34.48

- Alternative RC.4 (which is the same as Alternative RC.2 except for increasing scheduled traffic and stage length by 50%) is expected to reduce the cost adjusted for output quality by 34.4%, a saving of \$197 million. Again, the saving is achieved by exploiting economies of traffic density, stage length, and by changing traffic mix closer to the optimal mix.
- In comparing Alternatives RC.3 and RC.4, we note that the significant additional cost saving of 18% (34.4% minus 16.4%) is achieved mainly by cutting down the percentage of the charter outputs from about 10% to 4%.

In summary, significant cost savings can be attained by allowing the regional carriers (i) to expand into medium/long-haul scheduled routes, and (ii) by reducing the percentage of charter traffic to somewhere around 5%. Charters lower costs of scheduled service only if they make off peak use of aircraft acquired for scheduled service. Dedicated aircraft for charter services are cost effective only at high utilization rates.

K. Summary

In this chapter we simulated the cost changes of alternative air transport policies. We did separate simulations for regulatory policy, crown ownership policy, changes in the industrial structure of the firms, and changes in policy toward the regional carriers.

Table 8-12 summarizes the results of changes in unit costs. We see that relaxation of regulatory policy is expected to lower industry costs. The May 10th, 1984 policy, for example, is expected to eventually result in

a 4.4% cost reduction. This modest amount, when applied to the \$3.5 billion cost base of this industry amounts to potential savings of \$150 million per year. Additional savings could potentially be achieved by advanced liberalisation (\$125 million) or deregulation (\$150 million). The source of these regulatory policy savings are largely due to increasing traffic density (especially for the regionals), reduction of excess capacity, and inducing the regionals to a more efficient mix of charter and scheduled outputs.

We also found that cost savings are possible by changing policy toward Air Canada, the crown carrier. We believe the May 10th, 1984 instructions to Air Canada, requiring it to achieve private sector financial performance tests before additional equity is issued, could lead it to reduce capital costs somewhat. Privatisation of Air Canada could lead to substantial cost reductions, particularly from dropping low density short haul points, eliminating excess capacity and reducing labour costs. This simulation, however, ignores any predatory effects that a privatized, but still dominant Air Canada would have on other carriers. In Chapter 11 of this study, we incorporate the simulation results with other knowledge to give a more complete picture as to what this policy might look like. In Table 8-12 we also look at some hypothetical breakups of Air Canada. Cost savings here are largely due to reductions in labour costs, and reducing the scale of the company.

A number of simulations were performed of hypothetical alternative industry structures. These simulations are quite speculative given that

Table 8-12

Summary of Cost Reductions
Alternative Air Transport Policies

	Changes in Industry Unit Cost (Relative to Base Case)
<u>Regulatory Policy</u>	
• Pre May 10th Policy (Base Case)	-
• May 10th, 1984 Liberalization	-4.4%
• Advanced Relaxation	-6.5%
• Deregulation	-8.0%
<u>Crown Ownership Policy</u>	
• Pre May 10th Policy (Base Case)	-
• May 10th Policy	-1.8%
• Privatization Without Breakup	-6.9%
• Privatization With Breakup In Two Pieces	-4.9%
• Privatization With Breakup In Three Pieces	-5.3%
<u>Industry Structure Simulations</u>	
• Actual 1981 Structure (Base Case)	-
• Transfer 1/3 of Air Canada to CP Air (with reduction in # points served)	-10.0%
• Transfer 1/3 of Air Canada to CP Air (without reduction)	-8.4%
• Transfer 1/2 of Air Canada to All Carriers -equal shares	-7.8%
• Transfer 1/2 of Air Canada to All Carriers -proportional shares	-11.7%
• Two Carrier Policy	-5.1%
• CP Air - EPA Merger*	+3.0%*

Table 8-12 (continued)

Summary of Cost Reductions
Alternative Air Transport Policies

	Changes in Regionals Unit Cost (Relative to Base Case)
<u>Regional Carrier Policy Simulations</u>	
• Transfer 50% Charter to Scheduled	+0.2%**
• Charter only 5% of Total RTK	-10.6%**
• Transfer 50% Charter to Scheduled and Increase Output and Stage Length by 50%	-16.4%**
• Charter Only 5% of Total RTK and Increase Total Output and Stage Length by 50%	-34.4%**

* This simulation ignores demand effects and thus requires careful interpretation. Cost reduction are reductions for the combined carrier, not for the industry. This simulation is different than the current status where CP Air and EPA are operated separately.

** Cost reductions are only for the sum of the regionals; not for the whole industry.

route specific demand considerations are not considered. The source of cost reductions for most of these is from forming firms with higher average traffic densities. It is interesting to note that a two airline industry is not as effective as a six carrier industry with a much smaller Air Canada and much larger regional (and CP Air) carriers.

Finally, we simulated alternative policies toward regional carriers. The Regional Carrier Policy of the 1960's led these carriers to enter charter markets in a major way. This led to acquisition of equipment and staff specifically to serve charter markets. We find this to be economically inefficient. Charter service reduces costs only if they are performed in idle periods with the facilities and staff hired largely for scheduled services. If the regional carriers had the same ratio of charters to scheduled services as Air Canada had (roughly 5%), their overall costs would have been much lower. We wish to emphasize that the high costs of the Regional Carrier Policy are consequences of regulatory policy, not of management decisions. Regional carrier management in fact did exactly what profit maximization would dictate. They expanded into the only markets the regulators allowed them into - charter markets.

As a closing remark we wish to point out that these simulations are sterile analytical exercises. In Chapters 10 and 11, we undertake a more thorough look at the various policies considered here. There, the simulations are combined with other information and institutional knowledge to give what we believe is a more complete picture of changes various reforms are likely to result in.

Notes to Chapter 8

1. Note that $RPK = \text{Flights} \times \text{stage length} \times \text{seats/plane} \times \text{load factor}$. If we assume service frequency, seating density and load factors are constant, then a 10% change in RPK requires a 10% change in stage length.
2. In order to interpret the simulation results appropriately, it is necessary to take into account the fact that each carrier's total output and output mix (passenger, freight and charter) vary with the regulatory policy. Since consumers value the three outputs differently, the changes in output mix should be viewed as changes in the quality of the output. We use average revenue per RTK as an indicator of quality of output. By normalizing the average revenue per RTK around the value for the status quo (pre May 10) regulatory policy, we obtain the output quality index listed in the table. Quality-adjusted unit cost change (relative to status quo) = percentage change in total cost - percentage increase in total output - percentage increase in output quality index.
3. We assumed EPA will continue to be an independent division of CP Air.
4. The density of the two constituents stays the same, with CP Air having a significantly higher density (36.3 million RTK per point versus 3.9). Mathematically, the combined firm will have a density lower than CP Air (24.9 RTK/point).
5. Therefore, the percentage change in unit cost adjusted for changes in traffic size and quality is computed as "% change in total cost" minus "% change in RTK" minus "% change in output quality index".

Chapter 9: Demand Simulations

Chapter 8 described our simulation of costs in the Canadian airline industry under alternative policies. To conduct these simulations we had to make reasonable assumptions as to what levels of traffic would be for each carrier. Ideally, a simulation of the airline industry would use a route specific model of demand for Canadian air transport, and integrate it with our model of carrier costs. This is because carrier costs depend on traffic, traffic depends on demand, demand depends on price and price depends on costs.

This study did not have the resources available to build a full route specific model of Canadian airline demand,¹ and thus was not able to build a fully integrated industry model. Nevertheless, we attempted manually to obtain cost results consistent with what we know about demand. Chapter 6 described our information on the demand for air travel. For purposes of our simulations, the most important piece of information was the aggregate price elasticity of demand for travel in Canada. Oum and Gillen (1983) found that the elasticity lay in a range of -1.1 to -1.3. In the spirit of conservatism, we now use the lower magnitude.

In Table 9-1 we indicate the nature of total industry demand under alternative regulatory policies. First, we list the reduction in unit costs from Chapter 8 that we expected to occur. Next, we make the assumption that these cost reductions would be fully passed on to the consumer in the form of a fare reductions. Implicit in this is that alternative regulatory policies do not lead to higher rates of returns for carriers and

Industry Traffic Levels Under Alternative Regulatory Policies
Changes from the Status Quo (Pre May 10 Policy)

	May 10 1984 Liberalization Policy	Advanced Liberalization	Deregulation
1. Industry cost reduction	- 4.4%	- 6.5%	- 8.8%
2. Fare reductions	- 4.4	- 6.5	- 8.8
3. Fare elasticity	- 1.1	- 1.1	- 1.1
4. Change in industry traffic	4.8	7.2	9.7
5. 6 carrier traffic changes	2.3	- 1.4	- 2.0
6. "Others" traffic changes	2.5	8.6	11.7

that carriers will not fundamentally change the quality of the services they offer. Next, we apply the fare reductions to the elasticity to obtain total industry traffic changes. In row 5 we list the traffic changes used in the cost simulation for the 6 existing scheduled jet carriers. The difference, given in row 6, indicates the portion of industry traffic growth that is expected to accrue to other carriers. These carriers include Wardair (perhaps Worldways), existing and new third level carriers, cargo carriers and potential new jet carriers.

The main result from the Table is the large amount of growth potential for the other carriers under the advanced liberalization and deregulation policies. Both of these substantially ease entry conditions. The advanced liberalization policy opens up entry to any third level carrier.² Given the low air traffic density nature of many Canadian communities, especially relative to the U.S., we believe third level service can achieve greater importance in Canadian air transport than it had in 1981. With a limited number of points with sufficient traffic density to justify jet service, we see fewer opportunities for all new jet carriers. If existing Canadian carriers are successful in lowering costs then little new entry would occur. If they are not successful, then we believe that the "glamour" of air transport could attract all sorts of entrepreneurs with used DC-9's.

Notes to Chapter 9

1. We are not aware of any publicly available complete model of airline demand specific to routes and which includes a proper economic model fully incorporating price and class of service.
2. Advanced liberalization also allows Wardair entry into more markets, such as one way charter markets. Some of the 8.2% increase under advanced relaxation could go to this carrier.

PART III - CONCLUSIONS AND RECOMMENDATIONS

In this part, we draw together the various strands from Parts I and II. Chapter 10 discusses our conclusions on Regulatory Policy Choices. Chapter 11 does the same for policy toward the crown carrier, Air Canada. In Chapter 12 we ask the question, "Ownership versus Regulation: What is Important?"

Chapter 10: Regulatory Policy Choices

A. Introduction

In this chapter we draw together the various analytical findings of Part II concerning alternative regulatory policies. These are combined with institutional detail to draw together what we believe is a more complete picture as to how the industry will look under alternative policies. We examine the four alternative policies described in Section 3.8: Status Quo (pre May 10th, 1984), May 10th Liberalization, Advanced Liberalization, and Deregulation. For each policy we investigated each of the ten items listed in Table 10-1.

In each regulatory policy considered, we have held the Air Canada question at its May 10th, 1984 standing, i.e., 100% federal ownership, no breakup and Air Canada instructed to meet private sector financial tests to gain additional equity.

B. Status Quo Policy (pre May 10th, 1984)

We start by summarizing our findings concerning the historical (pre May 10th, 1984) policies prevailing in Canada, both regulatory and crown carrier policies.

Performance

- Most carriers exhibit constant returns to firm size
- All carriers except Air Canada have unexploited economies of traffic density
- Generally carriers have excess capacity, at least in part because the crown carrier was expected to establish a service standard to be used throughout Canada

Factors Considered in Alternative Policies

-
1. Carrier and Industry Performance (as measured by Costs and Productivity)
 2. Traffic Level and Mix
 3. Network Patterns
 4. Industry Structure
 5. Dense Route Market Structure
 6. Service to Small and Isolated Communities
 7. Fares and Service Quality
 8. Employment, Work Rules and Factor Prices
 9. Total Welfare Change
 10. Profitability
-

- Thus productivity of carriers was lower under the pre-1984 policy than it could have been

Traffic Level and Mix

- Traffic growth was due to secular changes in income and demographics. Only after the relatively recent introduction of discount fares did price lead to market growth
- Regional carriers have an inefficient traffic mix too heavily weighted toward charter. (The inefficiency is due to government policy, not managerial decisions)

Networks

- Point to point non-hub networks are used, (i.e. direct flights rather than hubbing flights), consistent with service maximization rather than cost efficiency
- Regional carrier networks have been forced to remain incompatible with their charter markets

Industry Structure

- Number of firms and relative sizes generally stable, 1964-1981

Dense Routes

- Most major routes served or even dominated by Air Canada
- Maturing of industry allowed increases in "competition" in dense routes

Service to Small and Isolated Communities

- Air Canada serves several small communities
- Regional carriers serve many small communities
- Many small communities receive jet service
- Existing policies may have lead to underdevelopment of third level carriers
- PCW may be allowing high profits in Northwest Canada

Fares and Service Quality

- Fares have been high as regulation leads to high service quality (e.g., crown carrier jet service to low density short stage length routes)
- The lower level of productivity resulted in higher fares

Employment, Work Rules and Factor Prices

- Regulatory and crown carrier policies may have led to compensation over and above what a non regulated industry would have paid. These extra returns are referred to as rents. Economists recognize rents arise due to constraints on markets and do not have any influence on the amount of service.
- The rents could have been captured by labour either through higher wages or restrictive work rules, the latter leading to higher levels of employment.

Economic Welfare

- Welfare has been lower than it could have been due to cost inefficiencies and not adequately serving low fare-low quality demands.

Profitability

- PCN and the regulatory regime have led to more stable industry profits than would have been the case without regulation in the industry. We have not observed excessive rates of return.

C. May 10th, 1984 Policy: Liberalisation

We now turn to a description of what we view the impacts will ultimately be of the May 10th, 1984 "Liberalisation" policy introduced by Lloyd Axworthy. This policy, described in Chapter 3, reduced downward fare regulation, removed restrictions on capacity and service frequency and allowed some new entry by license consolidation and restriction removal as well as allowing greater entry into charter markets. Other than constraining Air Canada's competitive response, the policy did not deal with the crown carrier issue. It also did not address adequately the issue of service to small and isolated communities. PCN remains the basis for regulatory decisions.

Details of our conclusions can be highlighted as follows:

Productivity

- Unit costs fall by 4.4%

- Traffic growth, particularly for the regionals will lead to some gains from density economies
- Removal of license restrictions could allow gains from increases in average stage length, especially for the regional carriers
- The lack of exit freedom limits gains from rationalizing a route
- The continuing existence of PCN limits gains from carriers entering markets better suited to them
- Continued regulation of fare increases limits opportunities for gains from third level carriers replacing jet carriers in short stage markets
- New opportunities for regional carriers in scheduled services should lead to gains from more optimal scheduled - charter traffic mixes

Traffic Level and Mix

- Industry traffic rises by 4.8%
- Existing carriers capture 2.3% of this. The balance goes to third level carriers and Wardair/Worldways
- Charter to scheduled proportion should fall for the regionals
- The expected reductions in price (at least in some markets like Vancouver-Regina) will result in a modest increase in traffic
- Traffic growth could be strongest in the longer haul markets where travellers are more responsive to price

Networks

- There may be more movement to hub and spoke networks
- This movement is limited due to the lack of exit freedom, and the continued use of PCN for entry into new markets suited to the chosen hub(s).

Industry Structure

- Little change foreseen
- The sheer size of Air Canada prevents any change in relative size distributions of other carriers
- Some entry of third level carriers
- New jet carriers unlikely due to continued existence of PCN

Dense Routes

- Consolidation of licenses and restriction removal could lead to regionals entering some routes
- Charter entry freedom could lead to entry on some routes
- Dominance of Air Canada makes it unlikely for a new participant in a market to become the major carrier

Service to Small and Isolated Communities

- Communities protected by North-South distinction and lack of exit freedom
- Social policy toward small communities not adequately addressed
- Eastern and Western Arctic should not be treated the same

Fares and Service Quality

- Some fare reductions will occur in some markets, especially short haul dense routes
- More price-quality options expected in long haul markets

Employment, Work Rules and Factor Prices

- Since entry by non-union carriers unlikely (due to PCN) wage pressures will not be great, except in anticipation of an eventual move to a deregulated policy
- Increase in traffic could increase employment

Economic Welfare

- Cost reductions increase welfare
- Increased traffic (due to lower prices in some markets) increases welfare
- The policy has potential for perverse cross-subsidy from the north to the south, thus reducing welfare

Profitability

- Cost decreases likely to be passed on to consumers rather than absorbed as extra profits (due to increased competition in many markets)
- PCN will probably continue to provide some protection to carriers
- Because of greater competition, profits are likely to be less stable

- Transcontinental carriers, faced with entry by regionals and charters, may face the most pressure on profits

D. Advanced Liberalization

The hypothetical "Advanced Liberalization" Policy was outlined in Chapter 3. Under it, greater entry, exit and pricing freedoms are allowed. PCN continues to exist. A small and isolated community program is initiated, and the Northern regulated zone is removed. The highlights of the policy are:

Productivity

- Industry unit cost falls by 6.5% (relative to pre May 10th, 1984 policy)
- Regionals would lower costs by seeking traffic density and stage length economies
- Air Canada could exit low density markets (due to social program) and achieve stage length economies

Traffic Level and Mix

- Cost reductions translated into fare reductions increase total industry traffic by 7.2%. Traffic for "other" carriers (third level, Wardair, etc.) grows by more than this amount
- Air Canada's domestic traffic shrinks (~10.5%) as it is still constrained in its ability to compete
- Regionals continue reducing charter traffic as they pursue opportunities for scheduled service

Networks

- Greater exit and entry freedoms should lead to increased use of hub and spoke network structures, and rationalisation of existing networks
- Regionals and Air Canada expected to have longer average stage length, as it is now easier to transfer short stage routes to other more suitable carriers

Industry Structure

- Third level carriers should capture much of the short haul routes

- Due to continued PCN test, entry by new jet carriers still not very likely

Dense Routes

- More even distribution of market shares possible
- One way charters could lower fares for nondiscretionary travellers

Service to Small and Isolated Communities

- Service will be maintained due to explicit policy
- Smaller aircraft likely to be used
- Service frequency may increase
- Fares should be stable due to social program
- Fares could fall in Western Arctic as competition is opened up

Fares and Service Quality

- As entry occurs in both short and long haul dense markets, fares should decrease from both competitive forces and cost savings. Fares on thin short-haul routes will likely rise but there will be a compensatory rise in service quality.

Employment, Work Rules and Factor Prices

- Since new non-union carriers not likely (due to PCN) no significant pressures on wages should occur for large carriers, except in anticipation of eventual deregulation
- Regional carriers may experience strong competitive pressures from low labour cost third level carriers
- Increase in traffic and move to more frequent small aircraft service should increase employment

Economic Welfare

- Cost reductions increase welfare
- Fare reductions increase traffic and increase welfare
- Move to more frequent service at small communities will increase welfare.

Profitability

- Continued existence of PCN provides carriers with some protection
- Profits likely to be more unstable, due to increased competition
- Regionals could gain profits due to cost reductions, but this is offset by increased competition from third level carriers

E. Deregulation

Our hypothetical deregulation policy was outlined in Chapter 3. It differs from Advanced Liberalization by the removal of all exit, entry and fare controls and the elimination of the PCN test. The small and isolated community social program is retained, and an airline employee retraining and relocation program is introduced. Below, we summarize its main points:

Productivity

- Industry unit cost falls by 8.8%
- Productivity gains larger than under Advanced Liberalization, due to economies of traffic density, along with optimum traffic mixes for regional carriers. No cost shift affect has been assumed
- All carriers expected to achieve gains from shedding excess capacity

Traffic Level and Mix

- Total industry traffic goes up by roughly 10%
- Air Canada loses traffic (-15%) since it is still constrained in its ability to act completely
- "Other" carriers capture most of the growth. These include third level carriers, Wardair and possibly a new jet carrier or two
- Charter service falls to "normal" proportions of roughly 5% of total traffic for regional carriers

Networks

- No major changes seen over Advanced Liberalization

Industry Structure

- Air Canada will be smaller
- Third level carriers will have larger presence in Canadian air transport than they have at present
- There may be a new jet carrier, depending on whether or not incumbent carriers lower their costs and fares
- There could be some consolidation of existing carriers, but we doubt whether we will see a two airline industry

Dense Routes

- Economies of traffic density indicate that the number of carriers actually in high traffic markets will remain small; perhaps two per market plus an occasional specialized carrier
- Regional carriers may judiciously enter a few high density long haul markets to keep at home the profits from the feed they generate to such routes

Service to Small and Isolated Communities

- No change over Advanced Liberalization. Service retained due to social program. Service likely to be on smaller aircraft, but may be more frequent

Fares and Service Quality

- Fares lower as costs are lower
- Dense long haul routes have greater reductions than thin short haul routes
- Thin short haul routes may have fare increases with corresponding increases in traffic frequency
- Short haul routes likely to have turboprop aircraft
- Fares could fall in Western Arctic

Employment, Work Rules and Factor Prices

- Pressure from a low cost new carrier or two could bring about wage reductions and or work rule changes
- Employment increases on net due to higher industry traffic and lower fares. This is offset somewhat by work rule reductions
- Individual carriers could have reductions in numbers of employees
- Employee retraining and relocation program implemented

Economic Welfare

- Cost reductions of 8.8% increase welfare
- Increase in traffic due to lower fares increase welfare
- Welfare transfer from labour to consumers. This is offset somewhat by the labour retraining and relocation program, financed by a three year ticket tax

Profitability

- Dropping of PCN reduces protection of carrier profits. Carriers that do not reduce cost structures, do not serve markets the way consumers wish and which are poorly managed may sustain losses. A few bankruptcies of carriers could be possible
- In the long run we expect rates of return in this industry similar to other mature, unregulated industries in the economy. Higher profits would attract more capital to air transport. Lower profits or sustained losses would lead to outflows of capital. As in most unregulated industries, profits will be more variable, particularly with regard to the business cycle
- Carriers which are quick to lower costs, dispose or find uses for excess capital, and correctly identify underserved market segments can expect to achieve higher rates of return in the short run

Chapter 11: Crown Carrier Policy Choices

A. Introduction

When we speak of policy toward the crown carrier, Air Canada, we have in mind two issues: whether to change its ownership (i.e. privatization) and whether or not it should be broken up to reduce its market dominance. The issue of policy toward Air Canada is inextricably intertwined with that of regulatory policy. Outcomes of regulatory reform depend critically on how Air Canada functions in Canadian markets. Similarly, outcomes of policy changes toward Air Canada depend on the regulatory environment. We are also aware that Air Canada's debt arrangements have a government ownership clause. This would affect, perhaps, the risk premium attached to such financial instruments. (This issue would be addressed in the process of privatization.)

If Air Canada were to be privatized, the sale price the government could realize will depend on whether a privatized Air Canada is free to roam in a protected regulated environment or if it must face the discipline of a free market. In the free market case, Air Canada's sale price will depend on whether it can use its current market dominance to its advantage or whether it will be restrained or perhaps broken up. The U.K. recognized this tradeoff between sale price and regulatory reform when, in 1984, it was contemplating both. The Thatcher government apparently has decided to maximize sale price. It will sell British Airways intact, apparently via a general stock offering. Thus, the U.K. has decided not to proceed with complete deregulation.

In Chapter 3, we discussed alternative policies toward Air Canada. There we identified four general policies to consider: status quo; May 10th policy; privatization without breakup; and privatization with breakup. Privatization can take one of three forms.

1. Sell on the open market to the highest bidder. The price received would reflect expectations of changes in regulatory policy. The new shareholders could force efficiency improvements by the airline.
2. General stock sale. This would be an open market operation which could disperse ownership widely among individuals and institutions. In contrast to number one, dispersed shareholders might not be able to force management to improve efficiency.
3. Sale to employees. This could represent a majority or minority interest. Efficiency gains would presumably be easier to obtain since labour would have an equity incentive.

There are various combinations of the above that can be considered. In addition, the government could hold minority or majority interests in the air carrier.

The dependence of regulatory policy and crown carrier policy makes it difficult to consider the separate impacts of each on how the industry will behave. In Chapter 10, we attempted to isolate regulatory impacts by holding constant the Air Canada question. Specifically, we evaluated alternative regulatory policies by holding Air Canada to its May 10th, 1984 status. This involves a federally owned Air Canada, not broken up into smaller pieces, but constrained in its ability to initiate competitive moves in Canadian markets.

In this chapter we move in two directions. First, in Section 3, we examine the impact of changing crown carrier policy, holding constant the

May 10th, 1984 regulatory policy. Second, in Section C, we speculate on what the industry would look like if we change both regulatory and crown carrier policy.

B. Changes in Crown Carrier Policy Only

B.1 Privatization without breakup

A privatized Air Canada, even in a liberalized policy environment, is likely to achieve some significant cost savings. These savings are conditional on the assumption that a privatized Air Canada will have no objective other than maximizing profits subject to the same regulatory constraints other carriers face. We assume Air Canada will no longer be required to establish a level of service to be maintained everywhere in Canada. It will further be free to drop some points not as well suited to its fleet of jet aircraft. It will no longer be required to establish and maintain a high level of wages to be copied by all other Canadian air carriers.

In Chapter 8, Section G, we simulated costs for this scenario. There, we found that costs could fall by 6.9%. The sources of these gains are reducing excess capital (it will no longer be required to set a high service standard in all markets), dropping some short stage routes better suited to regional or third level carriers, and a modest (5%) reduction in real wages. As we do not expect any new jet carriers under the May 10th regulatory policy, we do not anticipate that Air Canada will seek major wage concessions (unless in anticipation of an eventual move to deregulation).

We found in Chapter 5 that Air Canada has no economies of firm size to exploit (there may be diseconomies) and has exhausted most economies of traffic density. This suggests that it is unlikely to add any new Canadian cities to its network. It also suggests that it would not attempt to increase density of service in existing markets. This would result in no net increase in Air Canada's traffic, although the dropping of some short stage routes would increase its stage length. In other words, existing carriers should not fear Air Canada attempting to gobble up the 40% of domestic traffic it doesn't already have. We find that doing so would not give it any cost advantage. (See Section 11.C for a rationalization based on the S-curve).

There is a qualification to this. Our results suggest that although Air Canada has achieved all available economies of traffic density, costs may be relatively flat (i.e., constant) if it increases density. (I.e., while Air Canada would not lower costs by going after a greater share of its existing markets, costs would not rise for it either.) A market share (rather than profit) oriented private Air Canada could pose problems for its competitors. One way to alleviate this would be for the government to attempt to negotiate new international air agreements giving Air Canada profitable opportunities to pursue outside of Canada. Care must be exercised in these negotiations to ensure that Air Canada's gain does not come at the expense of another Canadian carrier.

We wish to point out that much of the cost savings we predict from privatization, are attributable to removing Air Canada's requirement of maintaining the service standard for Canada. This has resulted in higher

service levels than some markets warrant, and maintenance of service on some short stage length routes. It is eliminating Air Canada's use as a policy instrument that results in savings, not its privatization per se.

B.2 Privatization with breakup

In this scenario, Air Canada is broken up into one or two pieces and then each piece is sold to the private sector. Each piece consists of a set of regional routes coupled with some transcontinental routes. The pieces are allowed to compete with each other, particularly in transcontinental markets.

In Chapter 8, Section G we simulated costs for two cases: breakup into two pieces and breakup into three pieces. In each case we assumed there would be some reduction in the total amount of capital used. There would be some overlap in the cities they served. Since each of the new carriers would have a strong regional identity and route structure, we felt there would be no change in stage length.

Our simulations indicated that a two-way breakup would result in cost savings of 4.9% while a three-way breakup would result in cost savings of 5.3%. The reduction in excess capital is the major contributor to cost savings, as in the case of privatization without breakup. Unlike that case, we anticipate little in the way of stage length economies.

Since there would be some duplication of points by the new carriers, traffic density (output per point) will fall 17% for a two way break up, and 28% for a three way breakup, relative to a single large carrier. Returns to traffic density are roughly constant in this range so there

should be no cost advantage or disadvantage of this. Nevertheless, the smaller broken-up pieces of Air Canada may seek to improve their market shares. If both carriers are aggressive and successful, then this could be at the expense of the existing private carriers, such as CP Air.

Fruhan (1972) claims that there is an S-curve effect of market share versus capacity offered. This indicates that up to a 50% market share, a carrier could add a given percentage to the number of seats it offered per week in a market, and gain a greater increase in its market share. After 50% market share there are decreasing market share returns to capacity additions. If Fruhan's theory is correct, then this means that CP Air and others should have less to fear from a dominant (60% market share) Air Canada than from a set of smaller broken-up carriers. The latter are more apt to set off a capacity war.

C. Changes in Both Crown Carrier and Regulatory Policy

When one changes both regulatory and crown carrier policy, impacts become increasingly speculative. There is a common thread, however. A privatisation policy (with or without breakup), just like a move toward Advanced Liberalisation or Deregulation, involves an increase in competitive behaviour in airline markets. Both policies combined should lead to more of the benefits of competition (such as reduced costs leading to lower fares leading to greater traffic) and more of the costs of competition (dropping jet service at small communities, greater profit variability, asking labour for wage or work rule concessions).

The main points of simultaneous changes in these policies are as follows:

- both privatisation (with or without breakup) and regulatory reform lower costs
- if both occur at the same time, the speed at which markets adjust to new cost levels may be faster
- cost reductions should be greatest with deregulation and a breakup of Air Canada, particularly if part of Air Canada is transferred to existing carriers allowing them to reap traffic density economies
- a privatised Air Canada may be more apt to drop short stage routes under the freedoms of Advanced Liberalisation or Deregulation. This could result in even stronger (or at least faster) growth for smaller carriers than without privatisation
- the pieces of a broken-up Air Canada could attempt to increase each of their market shares under greater regulatory freedom, possibly at the expense of existing carriers
- the pieces of a broken-up Air Canada, due to their stronger regional affiliations, may be less inclined to drop small regional points from their networks

Chapter 12: Ownership versus Competition: What is Important

We have found in our analysis that the greatest proportion of the effects of reform are due to changes in the competitive environment. This comes from our investigations of changing only regulatory policy, as well as from an analysis of the sources of gains from privatization. In the latter case, gains come from dropping Air Canada's social requirement of setting national service standards rather than from privatization per se. Changes in the ownership and status of Air Canada have an incremental effect and does have some impact on the speed of adjustment.

It is the changes in the competitive environment which induce firms to adjust capital stock, to increase capacity utilization by altering the size and configuration of the network, and to get their input costs down. The competitive environment is also responsible for the broader price-quality offerings, the increase in service quality in local markets and the entry and development of the third level carriers.

Density economies arise from competition or at least the freedom to enter markets well suited to a carrier's feed. Downward pressures on labour costs will come only with the removal of PCN and the actual or potential entry of low cost non-union jet carriers.

Privatization and altering the size of the crown carrier do play a role. While they are not necessary conditions for the efficiency improvements resulting from changes in the competitive environment, they do create opportunities or conditions for additional gains to be made. They also affect the speed of the adjustment process.

One effect of privatization would be to change the psychology of the airlines, markets and the government regarding modifications to regulatory and air transport policy. Second, it changes the perception of existing firms and potential entrants regarding the commitment to change. In doing so it reduces uncertainty and any risks of policy reversals. Third, it creates the signal that the industry should respond to market forces rather than be administered. Fourth, the existence of a large crown carrier creates real or perceived barriers to entry which would stifle potential gains in a changed regulatory environment.

Privatization and altering the size of Air Canada have an incremental effect in reinforcing the welfare gains from competition. They alter the speed of adjustment to an efficient industry. The present value of this change in the rate of adjustment can be significant. We do not feel privatization is a necessary condition for achieving the gains from competition. What is necessary is that Air Canada be disciplined by the market for its actions. This means constraining its ability to use its size to engage in predatory behavior in markets and no access to public subsidies. This is best achieved by good definitions and good enforcement of predatory behaviour rules. Breakup, while it alleviates the problem, does not do away with the need for such rules.

ADDENDUM

"Freedom to Move": A new Policy Proposal

A. Introduction

As this report was going to press, the Honourable Don Mazankowski, Minister of Transport released a discussion paper titled "Freedom to Move: a Framework for Transportation Reform" (July, 1985). This paper contains a proposal to significantly reform the National Transportation Act, including replacing the CTC with a less powerful regulatory agency. The effect of the proposal would be to substantially deregulate all transport modes, including air transportation.

The paper's statement on policy objectives contains the spirit of the reform (page 17). What is at issue are the means to achieve "an economic, efficient and adequate transportation system" rather than the objective itself. Specifically, Mr. Mazankowski proposes to revise Section 3 of the NTA to actively promote intramodal competition in addition to its existing promotion of intermodal competition.

The act will also be revised to provide compensation to carriers for imposed public duties. (page 21). The paper makes it clear that such compensation is to take the form of direct subsidy rather than cross subsidy or cost plus formula subsidies. The latter two, often used in the current regulatory regime, lead to a less efficient transportation system.

B. Proposed Regulatory Changes in Air Transport

The Minister's discussion paper proposes the following changes in air transport regulation:

- Entry "Entry into any class of domestic commercial air service will be governed by a fit, willing and able¹ requirement." This replaces public convenience and necessity. Adequate liability insurance will be required as well as compliance with Department of Transport Safety Regulations. (page 25). No financial standards will be required. (page 26). Entry onto routes will no longer be regulated.
- Exit "Market exit will not be impeded except by a requirement of advance notice." (page 27). Carriers will be free to exit markets at will, subject only to a minimal advance notice on some routes.
- Pricing "There will be no ongoing regulation of domestic tariffs." (page 28). Shippers and travelers will be able to appeal fare increases to the regulatory agency. The agency can reduce or "overturn" such increases. The proposal makes it clear that such appeals of increases are to protect consumers, especially on monopoly routes.
- Service to Small Communities Several references are made in the paper to the effect that carriers will be free to drop any services. "It will then remain for the government to decide whether to solicit bids for continuing a service that carriers deem unprofitable." (page 22). The paper is not explicit about the actual mechanism for such a program.
- Employee Protection "Measures will be taken to assist those who might suffer severe economic dislocation under a new regulatory regime." (page 4). Again, the paper is vague here but presumably some protection for employees will be provided. (page 2).
- North-South division The current (May 10th, 1984) policy has different regulatory regimes in northern and southern Canada. This was to ensure service in the north. The policy will eliminate this geographic distinction (page 26). Threatened northern services presumably are to be continued by direct subsidy.

Overall, the policy proposal is very similar to the policy we termed "complete deregulation" and analyzed in this study. The major differences of the Minister's proposed policy and ours is the former's lack of a) a statement on predatory behavior by dominant firms except that stating anti-combines legislation will apply to predatory pricing (p.37) and b) a public

information program for ticket insurance in case of bankruptcy. We also have concerns as to whether the employee adjustment program alluded to in the Minister's paper will in fact be effective.

C. Crown Carrier Policy

The Minister's proposal does not address privatization or breakup of Air Canada, although statements made to the press indicated that Air Canada will remain the "national" airline at least for the time being. Presumably this means continued crown ownership.

The discussion paper does state that "Crown corporations in transportation will be expected to be effective and efficient while operating as good corporate citizens." (page 6) This could be construed to mean that Air Canada will be expected to meet vigorous private sector financial tests before receiving new government equity, and that it will be restrained from engaging in predatory behavior with respect to other air carriers. If so, then the Crown carrier policy in the "Freedom to Move" paper is similar to the one we analyzed under the name "May 10th, 1984 Policy."

D. Conclusion

If our interpretations of the Minister's proposals are correct, then our analysis in Chapter 10 section E of the "Deregulation" policy will be similar to that proposed by the Minister. That section analyzed a regulatory policy of complete deregulation while retaining Air Canada as a Crown carrier expected to be efficient, but not predatory. This policy was found to result in an industry 4.4% more efficient than the one prevailing on 15th July, 1985.

APPENDICES

and

REFERENCES

APPENDIX A

Analytical Impacts of U.S. Deregulation

A.1 Introduction

Many other studies have described the results of deregulation in the U.S. Here, we confine our attention to results which we do not believe have been adequately covered elsewhere.

A.2 Load Factors

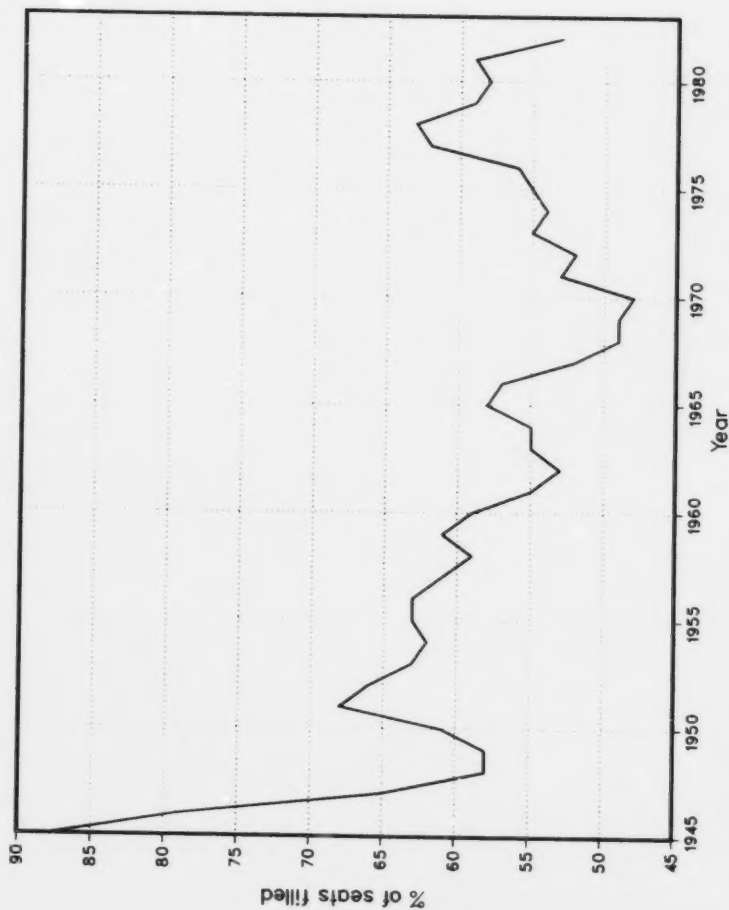
The load factor is the percentage of seats on a flight that are filled with paying customers. As we discuss load factors in this report, we use a load factor averaged over all flights of a carrier.

Load factors in the U.S. have increased during the advent and early years of deregulation, but fell off with the recession. The increase was predicted by economists due to an anticipated reduction in schedule rivalry. See Figure A-1. U.S. load factors still have not caught up with those in Canada, where unlike the U.S., capacity has traditionally been regulated. See Table A-1 and Figure A-2. Because load factors in the deregulated U.S. air transport system have not caught up to those in Canada, we believe that Canada is unlikely to achieve any gains from increases in load factors should deregulation occur.

In Figure A-3 we compare the load factors of the larger trunks with the smaller local service carriers. Load factors for the latter are uniformly lower than the trunks but had been catching up to the trunks during the 1970's. This may suggest that low density short stage length service

U.S Load Factors 1945 - 1983

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Figure A-1

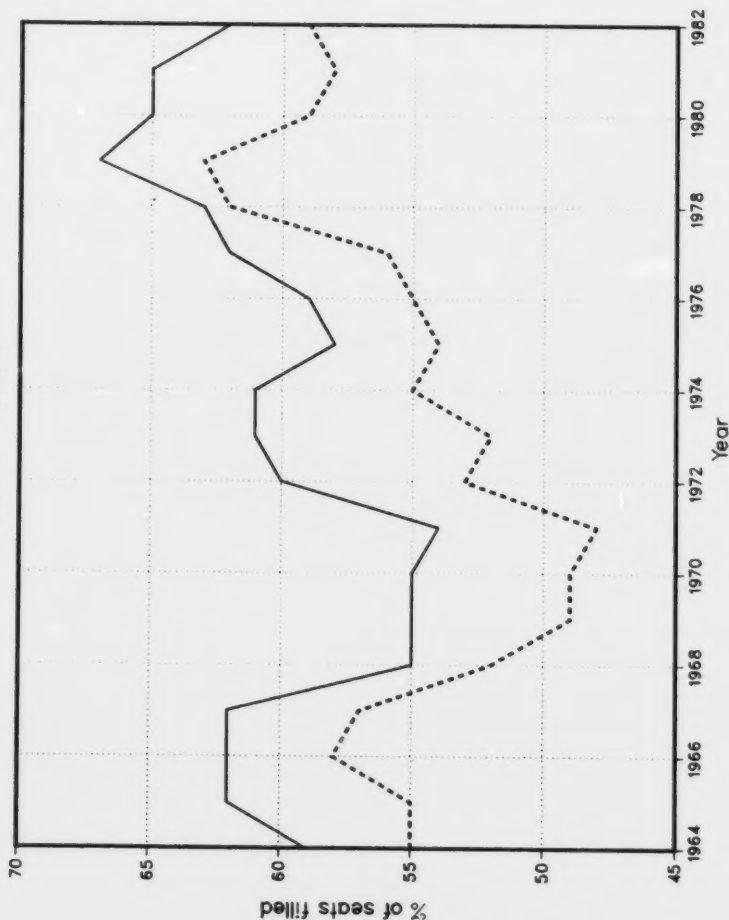


Comparison of Load Factors
U.S. Versus Canada

Load Factor for Scheduled Passenger Services		
	U.S.	Canada
1982	59*	62*
1981	58*	65*
1980	59	65**
1979	63	67**
1978	62	63**
1977	56	62**
1976	55	59***
1975	54	58***
1974	55	61**
1973	52	61**
1972	53	64**

Source: U.S. CAB Handbook of Airline Statistics, Air Carrier Traffic Statistics, Canadian Carrier Annual Reports to CTC

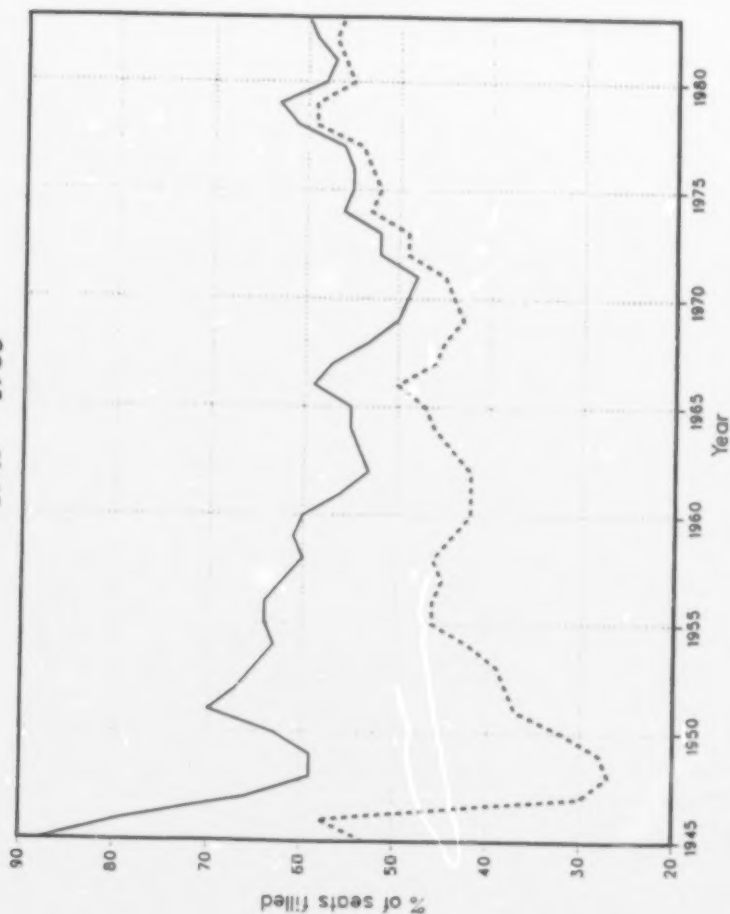
Load Factors Canada and the U.S. 1964 - 1982



U.S. Load Factors Trunk and Local 1945 - 1983

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Figure A-3

Legend
Trunk
Local



is best provided with low load factors. As the locals increased traffic density and stages, their load factors moved toward that of the trunks.

A.3 Traffic Mix - Charter Services

U.S. domestic air travel has always been dominated by scheduled passenger service. Nevertheless, substantial amounts of charter services have been provided. In 1975, the year before ABC charters were allowed, the CAB reported data for 7 "Supplemental" (i.e. charter services only) air carriers. Traffic data for these carriers are reported in Table A-2.

In Table A-3 we indicate the share of total charter services in total domestic services for years before and after deregulation. We also indicate the share of the supplemental carriers in total charter services. In Table A-4 we indicate the decline of domestic charter services by the former supplemental carriers. The total RPM of charter services offered by these carriers is quite a bit less than it was before deregulation. Further, for two major carriers, Capitol and World, charter services (which were 100% of total domestic service in 1976) are now insignificant portions of their total domestic output. Both carriers now provide significant amounts of scheduled domestic services. For Transamerica, domestic services (all of which are charter) now account for only 4% of its output.

In our view, these figures suggest an important facet of deregulation: charter markets almost disappear. We believe there are theoretical reasons for this. Demand models indicate that passengers, even discretionary travellers are sensitive to the time when service is offered. Passengers have preferred departure times, preferred departure dates and preferred

Table A-2

U.S. Supplemental Air Carriers Domestic Revenue Passenger Miles
1975 - 1976
(in millions)

Carrier	1975	1976
Transcontinental	220	111
Overseas National	219	404
Capitol	191	210
McCulloch	116	84
World	72	76
Modern	52	*
Evergreen	10	27
	—	—
Total Supplementals	890	920

*Data not reported due to strike

Source: U.S. CAB, Handbook of Airline Statistics

Table A-3

U.S. Airline Industry Share of Charter Services in RPM
(in Percent)

	Share of Domestic Charter Services in total Domestic Services	Share of Supplemental Carriers in total Domestic Charter Services
1975	3.89	17.09
1976	4.64	13.09
1981	1.49	11.99
1982	1.64	4.79

Source: U.S. CAB, Handbook of Airline Statistics, and Air Carrier Traffic Statistics

Table A-4

Former U.S. Supplemental Carriers
Domestic Charters as a Percent of Domestic Services

	Domestic Charter Service as % of Total Domestic Services		Total Domestic Charter RPM (Millions)	
	1982	1981	1982	1981
Capitol†	2%	3%	47	82
Evergreen*	-	100%	-	45
Overseas**	100%	-	1	-
Tansamerica***	100%	100%	81	172
World	1%	1%	14	24

Source: U.S. CAB, Air Carrier Traffic Statistics

* In 1982 Evergreen only provided charter freight services in domestic markets.

** In 1981 Overseas only provided international services.

*** Formerly Trans International

† Capital suspended operations in November, 1984.

destinations. The very nature of charter service reduces the choices a passenger has in all these areas. Some travellers are willing to travel at the convenience of the charter operator in exchange for a reduced fare. The regulated environment in the U.S. prevented scheduled carriers from offering deeply discounted fares to discretionary travellers. This opened up a market niche for charter operators. The regulatory authorities were happy with this arrangement as it provided very high "fences" between the "must go" and discretionary segments of the market. This would allow both segments of the market to receive at least some service, without any revenue erosion from scheduled services.

In a deregulated environment, scheduled operators can attempt to capture some of the revenue from the discretionary traveller. By erecting proper fences around various fares and by strictly limiting the availability of such via modern seat management, scheduled carriers can increase total revenue per flight. The discretionary traveller is now faced with choosing between a charter or a scheduled flight, at the same fare. As the latter offers greater choices of destinations, travel dates and times, it is usually chosen.

In our opinion then, many charter markets are an artificial product of regulation. They disappear in a deregulated environment. The figures in Tables A-3 and A-4 support this. The only charter markets that are likely to survive are for special events, very seasonal markets, and for groups which prefer to travel together (such as sport teams, political campaigns, movement of military personnel, etc.).

A.4 Traffic Mix - Other

Table A-3 indicates trends in the share of freight in total services. Over all we see freight has fallen from 9% to 6% of industry revenues, and from 19% to 17% in terms of revenue tonne kilometers. In general, freight is less important in the U.S. than it is for Canadian carriers, especially the Regional carriers servicing the north. In addition to cargo carried by passenger airlines, the U.S. had three major all-cargo carriers in 1976, Airlift, Flying Tiger and Seaboard. The latter merged with Flying Tiger while Airlift discontinued operations in 1981. Part of the decline in freight can be attributable to the emergence and growth of specialized express freight carriers since air cargo was deregulated in 1977. Although data for these express carriers are not reported by the CAB, we note that in 1982 the largest, Federal Express, had revenues of \$800 million compared to total freight revenues for all passenger/cargo carriers of \$2,200 million.

We do not have available to us detailed data by route for U.S. carriers. Thus we cannot analyse other aspects of traffic mix. Nevertheless, casual evidence leads us to draw several other observations about changes in traffic mix in the U.S. since deregulation.

First, there seems to be advantages in combining regional routes with transcontinental trunk routes. Bailey, Graham and Kaplan (1985) point out that most of the former local service carriers tied their regional routes together around a hub, and then added transcontinental routes out of the hub. The trunk carrier, United Airlines, dropped local service routes immediately after deregulation but has since added them back. American and

Table A-5

Freight Share in Total Domestic Output
Selected U.S. Passenger Air Carriers

	1982 Freight Share		1976 Freight Share	
	In RTK	In Revenues	In RTK	In Revenues
Grandfather carriers:				
Pan American	22%	7%	32%	16%
United	16%	4%	18%	8%
American	18%	7%	21%	9%
Eastern	12%	3%	9%	5%
U.S. Air	5%	2%	9%	6%
Frontier	6%	3%	9%	3%
New entrants:				
People Express	N/A	2.4%	-	-
New York Air	0.1%	0.4%	-	-
Midway	9%	0.4%	-	-
Jet America	3%	1.3%	-	-
Former intra states:				
PSA	3%	2%	N/A	N/A
Southwest	1%	3%	N/A	N/A
Total Domestic Air Carriers	17%	6%	19%	9%

Source: U.S. CAB, Air Carrier Financial Statistics, Air Carrier Traffic Statistics

TWA have placed substantial orders for DC-9 aircraft, a plane suited to short stage - lower density local service routes.

There also appears to be gains to coupling international routes with domestic routes. Pan Am, for example, had essentially no domestic routes prior to deregulation. In 1982 it acquired National, a domestic carrier. This acquisition apparently did not achieve the economies it had hoped for. In the past two years Pan Am has essentially discarded the old National routes and used the aircraft and personnel to build a new domestic route structure feeding its international gateways of New York, Miami, Los Angeles and San Francisco. United had no international routes in 1978. It has since added service to points in Asia and Mexico. Several other U.S. carriers have added points to Europe, Latin America and Asia when the U.S. has been able to negotiate new bilateral agreements.

A final observation is the emergence of close links between large carriers and the smaller, third level carriers in the U.S. The feed these carriers provide seems to be quite important in providing economies of density to the larger carriers. The fact that no commuter has been merged into a larger carrier suggests that there are cost advantages to keeping these operations separate. I.e., there are diseconomies of scope between turboprop feeder services and large jet services.

A.5 Network Patterns

One of the clearest trends since U.S. deregulation is the adoption of the hub and spoke route networks by almost all carriers, new and old. Bailey, Graham and Kaplan (1985, pp.75-79) document this well. Table A-6

Table A-6

U.S. Airlines Growth in Hubbing
(Taken from Bailey, Graham and Kaplan [1985])

Airline	Leading Hub City in 1983	Percent of airline's domestic departures at hub		Percent change in departure's at hub
		1978 (2nd quarter)	1983 (2nd quarter)	
American	Dallas-Fort Worth	11.2	28.6	113.7
U.S. Air	Pittsburgh	16.0	23.2	45.7
Continental ^a	Houston	12.8	22.9	45.8
Delta	Atlanta	18.3	21.4	11.4
Eastern	Atlanta	18.3	21.0	1.0
Frontier	Denver	18.0	33.8	23.8
Northwest ^b	Minneapolis-			
	St. Paul	16.1	20.7	18.7
Ozair	St. Louis	15.5	35.6	53.7
Pan American ^c	New York	12.3	35.6	-1.8
Piedmont	Charlotte	3.7	19.6	583.0
Republic ^d	Minneapolis-			
	St. Paul	3.4	7.7	91.1
Trans World	St. Louis	11.9	33.0	81.3
United	Chicago	13.8	18.9	1.5
Western	Salt Lake City	10.3	16.9	129.3

Source: Service Segment Data. Taken from CAB Report to Congress on Implementation of Deregulation Act.

- a. Continental and Texas International departures were combined for 1978.
- b. There was a strike at Northwest in the second quarter of 1978. Therefore, in both years data for service during the first quarter are reported.
- c. National and Pan American departures were combined for 1978.
- d. North Central, Southern, and Hughes Airwest departures were combined for 1978.

is taken from their treatise. It indicates the dramatic increase in hubbing by almost all air carriers. Some large carriers, such as United, American and Eastern operate more than one major hub.

While others have documented the growth and importance of hubbing, we feel not enough attention has been given to distinguishing two types of hubs: the complexing hub and the point-to-point hub.¹

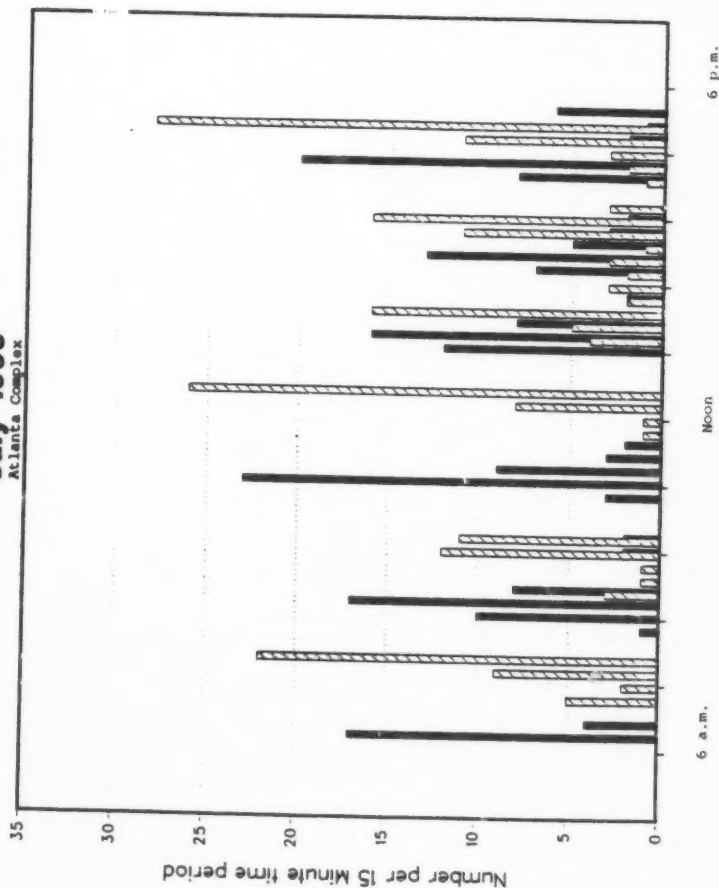
Carriers can have two different reasons for hubbing. One is to provide better service to passengers. For example, there may only be sufficient demand for one flight per day from small city A to large city B. However, if traffic from A to C and A to D could be routed through city B, then perhaps three flights per day can be provided from A to B. By adding more spokes to the hub, service frequency can be increased to each city on the network.

The key to being able to actually capture all this traffic, however, is to be able to provide quick connections between incoming and outgoing flights at the hub. Passengers are generally unwilling to wait two or more hours to make a connection, particularly if nonstop point-to-point service is available.

To provide quick connections, airlines schedule "complexes" of several arriving flights followed by an equivalent complex of departures 30 to 75 minutes later. Delta Airlines operates such a set of complexes at its Atlanta hub. Figures A-4 and A-5 illustrate these. Each bar represents the number of arrivals and departures in every 15 minute period. The graphs clearly illustrate batteries of arriving flights followed half an hour later by a battery of departures. Figure A-4 shows the pattern more clearly, while Figure A-5 illustrates the pattern over the whole day.

Delta Airlines Arrivals and Departures

July 1983
Atlanta Complex



Source. Official Airline Guide

Atlanta Complex



A second reason for operating a hub is to save costs. Hubbing allows a carrier to realize economies in maintenance facilities. Potentially, aircraft utilization can also be higher. By channelling all aircraft through the hub, it will be easier to find uses for planes in otherwise idle hours. Personnel at the hub can be better utilized, due to the higher volume of traffic.

The complexing type of hub, however, is very expensive to operate. A look at Figure A-4 indicates several periods of over an hour with little or no activity. These are times when passengers are busy changing planes. Personnel inside the terminal and servicing aircraft are quite busy. Others, however, whose jobs are related to aircraft movements (e.g., flight personnel) are idle at this time. When the next phase comes, the opposite is true. Further, aircraft can be idle at gates for periods longer than is necessary to service the aircraft. Because large numbers of planes are on the ground during a complex, the airline needs a large number of airport gates and corresponding personnel. In sum, the complex hub is expensive since it idles aircraft, requires many gates and has long periods when personnel are idle. It is an expensive type of network, suitable only if the airline's customers are willing to pay a higher price to get convenient connections.

Some carriers chose to operate hubs, but not of the complexing type. We refer to these hubs as "point-to-point" hubs. Here, flights arrive in a fairly steady stream throughout the day, resulting in high employee utilization and a need for fewer gates. As soon as an aircraft is serviced, it is 'turned around' and sent out again. Equipment utilization is high.

Figures A-6 and A-7 demonstrate such a point-to-point hub; that of People Express, a new carrier, in Newark. Note also that People's hub has considerable activity late at night and early in the morning relative to Delta's.

In summary, two types of hub operations have emerged since deregulation. The "complex" type of hub is expensive to operate, although it provides a high level of service to passengers. It is suitable for a carrier whose customers are somewhat price inelastic, but service elastic. The "point-to-point" hub is less costly and allows high rates of employee and capital utilization (both ground and flight). It is suitable for carriers servicing passengers responsive to price and less responsive to service.

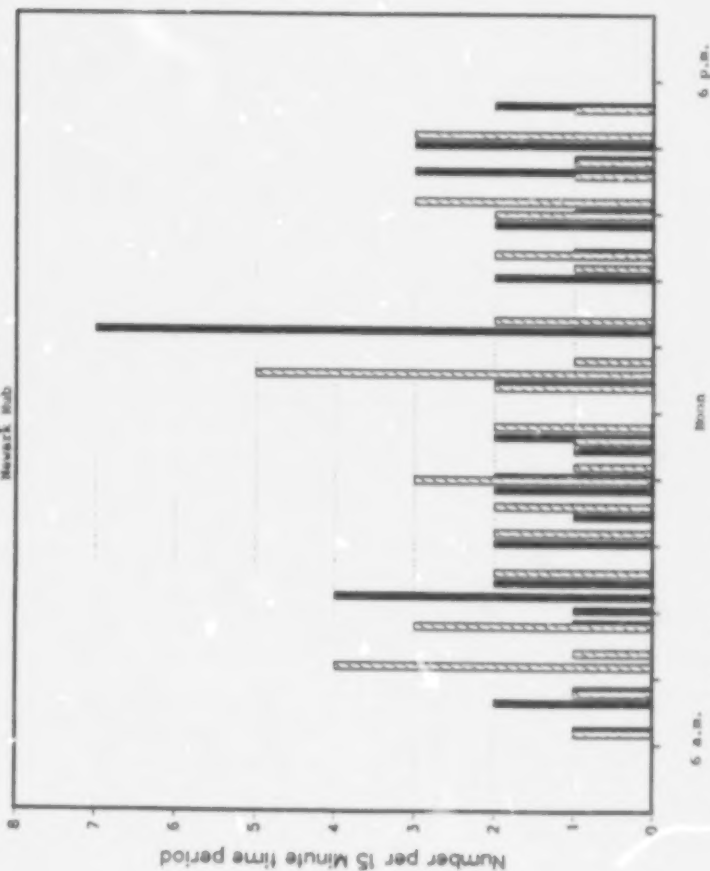
Because of the emergence of hub and spoke networks since deregulation, carriers are apt to now think in terms of adding sets of routes or connections to their network. This is in contrast to the regulated era, when routes were considered on a piecemeal basis as the regulatory agency made them available.

A.6 Industry Structure

The worst fears of some deregulation opponents concerning industry structure have not materialized. There has been no evidence of increasing concentration either industry wide or route-by-route. The share of the large trunk airlines has fallen somewhat since 1978. This is due to the strong growth of the former local service carriers, the former intrastate carriers and the commuter carriers, as well as the appearance of several totally new airlines such as New York Air and People Express.

People Express Airlines Arrivals and Departures May 1983

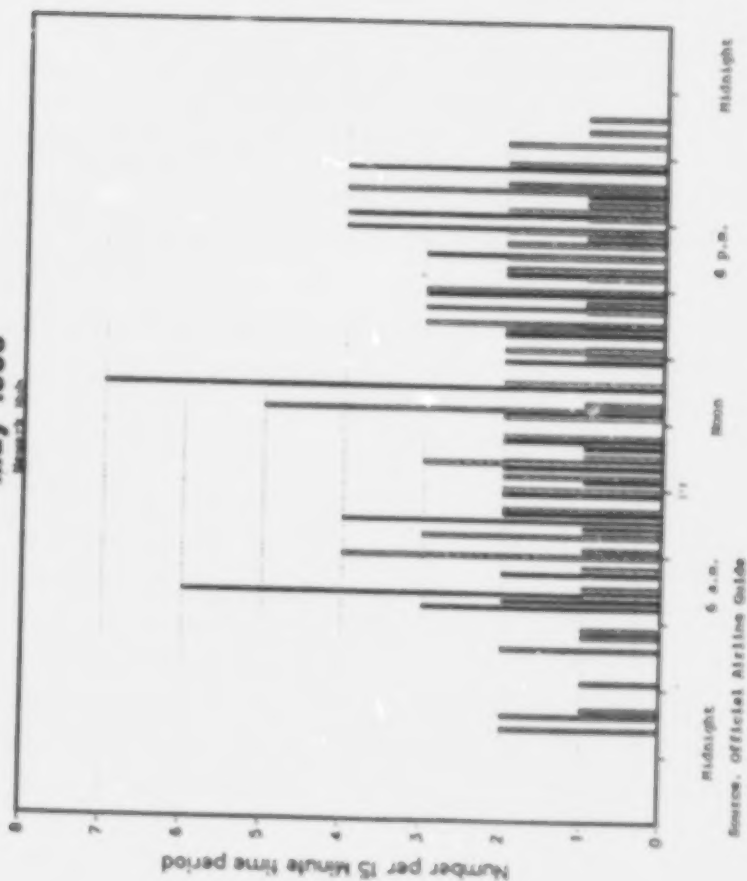
Newark, N.J.



Source: Official Airline Guide

**People Express Airlines
Arrivals and Departures
May 1983**

10



While there have been mergers; Pan Am and National; Continental and Texas International; and North Central, Southern and AirWest; none of the combined carriers dominates the industry in any sense. The largest of the merged carriers, Pan Am, ranks only fifth in terms of total revenues.

As expected, there have been some bankruptcies in the industry. The most notable was Braniff in 1982. This bankruptcy disrupted travellers for only a few days as other carriers, especially American were able to move into its former markets. The bankruptcy of Continental is alleged to have been a carrier busting tactic. Within days the carrier was flying again. Several carriers, large and small, totter on the brink of financial collapse, while others, again large and small, enjoy rich financial rewards.

On average, most city pair segments have only one to three carriers. The average increase in carriers per route has only been .3 since 1978. The growth in hubbing however has increased the number of alternative routings between cities thereby providing both actual and threatened competition.

Some concern has arisen in the past year that the two largest carriers, United and American are growing in strength. Table A-7 notes the increase in their domestic market shares from 1982 to 1983. Their market shares, however, are still less than they were before deregulation.

Table A-8 indicates that the sum of their profits exceeded total industry profits in 1983, and that their losses in 1982 (due to the recession) were minor relative to the rest of the industry. It is interesting to note that these two carriers have the most successful airline reservation systems.

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Table A-7

Market Shares
United and American

	Domestic Revenues (\$ billions)			Market Share (percent)		
	1976	1982	1983	1976	1982	1983
United	2.5	4.3	5.0	18.7	15.6	16.8
American	1.8	3.5	3.9	13.4	12.7	13.0
Total Industry	13.4	27.5	29.7			

Source: U.S. Civil Aeronautics Board, Handbook of Airline Statistics, Air Carrier Financial Statistics

Table A-8

Systemwide Operating Profits
United and American

	Profits (\$ millions)			Profits as Percentage of Total Industry Profit (percent)		
	1976	1982	1983	1976	1982	1983
United	34	-68	132	5	-9	42
American	71	-15	249	10	-2	69
Total Industry	722	-738	361			

While the final industry structure will still take several years to reveal itself, we see no evidence that American and United will come to dominate the industry. These two carriers, however, are preparing to do major battle with each other. In January 1985, American instigated a widespread fare war hitting very hard in United's markets. Further, American has announced its intention to become a major force in Denver, United's second largest hub. Both American and United operate in Chicago, with that city being United's largest hub and American's second largest.

A.7 Productivity

Annual Productivity growth has increased from 2.8% per year before deregulation to 5.1% after deregulation. [See Caves, Christensen and Tretheway (1983)]. The largest source of this growth has been exploitation of economies of traffic density as output grew without similar growth in the number of points carriers serve. A second contributing factor has been a reduction in the rate of growth of capacity, as measured by the amount of capital stock available for service. This is consistent with the findings of Caves, Christensen and Tretheway (1983, 1985), that U.S. airlines had excess capital stock. Apparently in the deregulated environment, U.S. carriers are adjusting capital toward optimum (i.e. lower) levels.

In unpublished work by Tretheway, there is evidence that some productivity gains have been specific to labour. Table A-9 gives the estimated productivity shifts by year associated with labour input. Negative numbers indicate a negative shift in the share of labour in total cost, after controlling for effects of changes in the price of labour, fuel, etc. We

U.S. Airline Cost Function
Shifts in Cost Function Specific to Labour
(Standard errors in Parenthesis)

Year	Estimate	Year	Estimate
1970	.042 (.012)	1977	-
1971	.029 (.012)	1978	-.034 (.008)
1972	.012 (.012)	1979	-.046 (.009)
1973	.012 (.012)	1980	-.015 (.011)
1974	.014 (.009)	1981	-.022 (.011)
1975	.017 (.009)		
1976	.008 (.008)		

Source: Unpublished results of Tretheway.

speculate that these shifts are reflections of increases in labor productivity due to work rule changes.

If we separately look at the productivity performance of the large trunks and the smaller local service carriers we find that the latter had the strongest growth. Table A-10 is taken from Caves, Christensen and Tretheway (1983). Here we see that the annual rate of productivity growth increased 1.3% per year for the trunks since deregulation and 2.3% for the locals. If we look at the bottom row of the table we find the amount of that growth that is unexplained by exploitation of economies of density, decreases in capacity, and increasing load factor. Trunk unexplained productivity increased by only 0.1% per year. The locals however increased by 1.3% per year. From this one might speculate that it is the smaller air carriers that have the greatest potential to increase their efficiency.

Further information on U.S. productivity growth since deregulation and its sources can be found in Caves, Christensen and Tretheway (1983).

Notes to Appendix A

1. We are grateful to Tony Ellison of the Economic Council of Canada for bringing this to our attention.

U.S. Trunk and Local Service Airlines
Average Annual Growth Rates of Productivity

	Trunks		Locals		Combined	
	1970-75	1976-80	1970-75	1976-80	1970-75	1976-80
Total Growth in TFP	2.6%	4.9%	4.0%	6.3%	2.8%	5.1%
Sources of TFP growth						
... output growth	1.6%	2.8%	2.4%	4.0%	1.6%	2.9%
... capacity growth	-1.2%	- .5%	4.1%	1.7%	-1.2%	- .6
... increase in load	.2%	.4%	1.0%	.4%	.3%	.4
... unexplained TFP growth	2.1%	2.2%	1.1%	2.4%	2.0%	2.3%

Source: Caves, Christensen and Tretheway (1983).

APPENDIX B

Regulatory Reform in Chile's Air Transport

B.1 Introduction

Chile is located along the southwest coast of South America. It is 4,200 km in length, with a maximum width of only 400 km. The population of Chile is 11.5 million. Forty percent of the population of Chile lives in the Greater Santiago urban area. In 1982 Chile's airlines carried 550,000 passengers in domestic service and 275,000 passengers in international service. This total of 825,000 passengers in 1982 is a small fraction of the 20 million passengers carried in Canada in that year.

The level of economic development in Chile is considerably less than that of Canada. 1974 per capita GNP was approximately 1,700.00 U.S. dollars. This compares with Canada's per capita GNP of 9,700.00 U.S. dollars and the U.S.'s \$10,820. Among South American countries, Chile had been considered to have one of the better economic standards of living. This position however is beginning to erode with the severe economic recession of the past several years in Chile.

Historically, Chile has had a much stronger democratic tradition than many of its neighbors. Coupled with this has been a very strong market and laissez faire orientation, again relative to other South American countries. While the market tradition has continued in recent years Chile's democratic traditions have not.

Chile has a long history of air transport operations. LAN-Chile, the major government owned air carrier, has been operating since March, 1929. Traditionally, LAN-Chile has provided the bulk of Chile's domestic services in addition to being the Chilean flag airline. As one of the oldest of the

South American air carriers, LAN-Chile had earned a large proportion of its revenues from fifth freedom traffic elsewhere in South America.¹

Economic regulation of air transport in Chile has been the responsibility of the Civil Aeronautics Board of Chile. The CAB reports directly to the Minister of Transportation. Before 1979, regulation extended to fares, routes operated, capacity offered and ownership of air carriers.

In 1979 a new air transport law took effect in Chile. This law removed all regulation on fares, routes operated, capacity offered and ownership of air carriers. This deregulation of air transport applied to both domestic and international carriers. Specifically, cabotage rights were allowed within Chile to foreign air carriers (provided foreign governments offer reciprocal rights).

At the time of deregulation, Chile had two major airlines. LAN-Chile, the government owned airline, had approximately eighty percent of the domestic market. The bulk of the remainder was captured by Ladeco, a privately owned air carrier. Ladeco is owned by a large corporate conglomerate in Chile.

Chile and Canada are quite different in terms of geography, culture, and political institutions. Nevertheless, there are some similarities between Canada and Chile which make a looking at Chile's experience with deregulation worthwhile. Both countries have a large government owned airline which dominates the domestic air transport market. Both countries have markets significantly smaller than that of the U.S. Chile's market, of course, is significantly smaller than that of Canada. It thus provides an interesting contrast to the U.S. experience when assessing what might happen in a deregulated Canadian air transport environment. Another simi-

larity between the two countries is that their air routes tend to be concentrated in a long and narrow band along the border. Both countries have very important transborder and international markets. Both countries have several isolated communities for which air transport is the only viable transportation link, at least at certain times of the year. Canadians might look to Chile's experience with deregulation for an example of at least one approach to serving small and isolated communities in a deregulated environment.

Before continuing, it is important to point out the major differences between Canada and Chile. Chile's population is less than one half of that of Canada. Further, Chile's population is concentrated around a single major city. Canada, on the other hand, has a very dispersed population with three major international gateways for air transport. Chile's economic development is much lower than that of Canada. Chile's air markets are much thinner (i.e. less dense) than those in Canada. Finally, Chile's current political institutions and policies are dramatically different than those in Canada. These important differences require one to be very careful in making any inferences for Canada from Chile's experience with deregulation.

B.2 The Major Chilean Air Carriers

Before proceeding to analyze the impact of deregulation in Chile we start by describing Chile's airlines. LAN-Chile is 100 percent owned by the government of Chile. Until 1977 it was Chile's sole international air carrier. Traditionally, it has carried 33 percent of the traffic to and from Chile with the balance captured by foreign carriers. Until recent

years, LAN-Chile received a major portion of its international revenues from fifth freedom traffic in other South American countries. LAN-Chile's fleet in 1982 consisted of two DC-10's, four Boeing 707's, and two Boeing 737's. LAN-Chile has always been highly subsidized by the government. For example, in 1972 its government subsidies totalled 15 million dollars.

Ladeco has been operating since November, 1958. It is owned by one of the largest Chilean private conglomerate corporations.² Until 1977 it flew only domestic routes. Since then it has acquired three routes elsewhere in South America outside of Chile. Its 1982 fleet consisted of three Boeing 727's and three Boeing 737's. In contrast to small Canadian airlines with similar fleets, Ladeco has traditionally offered very little charter services.

Fast Air is a new all cargo carrier that has grown rapidly since the 1979 deregulation law. It is privately owned and began scheduled services in 1979. Prior to this, during 1978, it operated as a non-scheduled air carrier. Its fleet in 1982 consisted of a single Boeing 707. In spite of having a single aircraft, by 1982 it was already providing 15 percent of the total Chilean tonne kilometres performed (passenger and freight).³ Its routes are largely international, from Santiago to other countries, particularly the United States (Miami and New York), Columbia, Panama, and Brasil. The air carrier has applied for authority to operate scheduled passenger services between Santiago and Miami and New York in competition with LAN-Chile and U.S. air carriers.

B.3 Air Transport Developments Since Deregulation

Data on deregulation in Chile is very difficult to obtain. The two

major sources are the International Civil Aviation Organization in Montreal and unpublished reports of the CAB of Chile. As with the United States, it has been difficult to sort out the effects of domestic deregulation of air transport from the effects of a simultaneous economic contraction. Chile entered a very deep recession in 1981. In 1982 its real gross domestic product fell by 12 percent and in 1983 an additional 4 percent. During this time unemployment in Chile soared and wage rates in the country fell dramatically. The fall in wages in Chile was a result of a government policy requiring wage decreases in all sectors of the economy. During this recession Chile had inflation rates between 13 and 20 percent. This is significantly lower than traditional inflation rates which often were greater than 100 percent per annum.

Since deregulation, total domestic traffic in Chile has grown at a faster rate. In 1975 290,000 domestic passengers were carried. In 1978 330,000 passengers were carried for an average annual growth rate of 4.3 percent per year. However, by 1982, 520,000 passengers were carried. This is an 11.4 percent per year growth in passengers carried since 1978.⁴ This acceleration in traffic growth occurred at the same time the country was entering a very severe economic contraction.

This growth in market has not been shared equally by the two carriers. LAN-Chile has lost both in market share and in the absolute number of domestic passengers it carries. In 1975 it provided 80 percent of the domestic passenger kilometres. In 1978 this had fallen to 71 due to the emergence of Ladecc. In 1982 LAN-Chile's domestic market share was only 45 percent. In terms of passengers carried rather than passenger kilometres, LAN-Chile's drop in market share was even more dramatic. It carried 80

percent of the domestic passengers in 1975 but by 1982 it was carrying only 30 percent. The difference in market shares from domestic passengers versus domestic passenger kilometres indicates that LAN-Chile's remaining passengers are being carried on very long stage lengths. In absolute terms LAN-Chile carried 225,000 passengers in 1975, 227,000 in 1978 but only 155,000 in 1982.

Privately owned Ladeco has achieved very strong growth since deregulation. It carried 60,000 passengers in 1975, 102,000 passengers in 1978, and 360,000 passengers in 1982. In addition, Ladeco is now carrying 60,000 passengers in international services.

The impact of deregulation on employment is not clear. Table B-1 indicates that Ladeco's employment has increased from 220 employees in 1978 to 481 employees in 1982. During the same period LAN-Chile's employment has dropped from 2,812 to 1,487. This drop in employment at LAN-Chile might not be solely due to deregulation. We see in Table B-1 that LAN-Chile had 4,800 employees in 1974. This had already dropped to 3,264 by 1975 and further dropped to 2,812 in 1978. This decrease from 4,800 to 2,800 occurred during a time when air transport in Chile was still strictly regulated. It is difficult to determine what the source of the fall in employment at LAN-Chile has been. From 1975 to 1978, for example, LAN-Chile's total passengers carried (domestic and international), dropped only slightly from 448,000 passengers to 444,000. One might speculate that the general downward trend in employment at LAN-Chile is perhaps the result of the change in government policy toward public enterprise since the military takeover in 1973. We have, however, no concrete evidence as yet to support this. Nevertheless, we feel that it is accurate to state that some of the

employment drop since 1978 has been due to LAN-Chile's drop in traffic arising from strong competitive pressures from Ladeco, Fast Air and also from international air carriers.

Table B-1

Chilean Air Carriers
Number of Employees

	LAN-Chile	Ladeco	Combined
1974	4,800	N/A	-
1975	3,264	N/A	-
1978	2,812	220	3,032
1982	1,487	481	1,968

Source: ICAO, Fleet and Personnel

The impact of deregulation on service at small communities is also ambiguous. On the surface it appears that service at small communities has deteriorated dramatically. In 1978 LAN-Chile served 30 cities and Ladeco 8. Together, the two carriers provided scheduled service to 33 cities in Chile. In 1982 LAN-Chile was serving only 4 cities, Ladeco had increased to 12 and the combined total number of cities serviced in Chile was 13. This dramatic drop from 33 cities receiving scheduled air service in 1978 to 13 receiving service in 1982 appears to indicate a disaster in terms of service at small communities.

This dismal portrait however is not completely accurate. Many of the cities with scheduled service in 1978 had flight frequencies of once a week or less. Since deregulation, LAN-Chile has dropped many of these infrequently served points. The slack has been taken up by the growth of a number of third level air carriers. In 1978 Chile had 40 third level carriers whereas in 1982 there were 83. Many of the third level carriers do not operate on a scheduled basis. The CAB of Chile claims that service at communities dropped by LAN-Chile is much more frequent now than it was prior to deregulation, but that service is not scheduled. The CAB has indicated to us that many of third level air carriers operate on what we might refer to as "dial-a-plane" basis. Passengers desiring a flight into or out of small city will call the air carrier to indicate their desire for a flight. The air carrier then will collect a number of requests for service, pool them and provide the service at the most convenient time. The CAB claims this is preferable to infrequent scheduled service. Furthermore, the CAB of Chile claims service at the small communities is now being provided at rates which are much lower than the rates that were being charged by LAN-Chile. We do not have any data, as of yet, to either refute or support these claims.

We now turn to the impact of deregulation on airline fares in Chile. In 1976 LAN-Chile was receiving a yield of 3.77 U.S. cents per revenue passenger kilometre. In 1978 this had increased to 5.46 cents, an increase of 20 percent per year. In 1982 yield jumped to 9.92 cents. This increase of 14 percent per year is less than that in the 1976 to 1978 period. The 1976 to 1978 increase was roughly the same as the rate of increase in the consumer price index in Chile. However the increase from 1978 to 1982 were

several percentage points per year less than the increase in the CPI. We should note that airfares increased dramatically in the first year following deregulation. These airfares, however, stabilized resulting in the lower, 14 percent per year increase over the 1978 to 1982 period.

Internationally there were several important developments in airfares. In response to a new bilateral negotiated with the United States, airfares from Santiago to Miami dropped by 30 percent. Fares from Chile to Spain dropped by 50 percent in response to new developments after deregulation. Spain represents a very important market for much of South America. In response to these dramatic drops in fares to two major tourist destinations, Miami and Spain, Brazil reluctantly agreed to a 20 percent reduction in fares from Santiago to various tourist cities in Brazil.

While deregulation and some new bilateral agreements stimulated some important markets for Chile's flag air carrier, LAN-Chile, there were other ominous events occurring in the international scene. LAN-Chile traditionally has relied on a significant amount of fifth freedom traffic elsewhere in South America. As one of the original South American airlines it enjoyed such traffic for a long period. However, in recent years several South American countries have been developing their own national flag carriers. For example, Peru has been aggressively promoting its air carrier AeroPeru. As Chile's neighbors have developed their flag carriers they have been revoking the fifth freedom rights of LAN-Chile. In 1977 LAN-Chile had 25 fifth freedom rights under various bilaterals. In 1984 it had a single fifth freedom route. Juan Langlois, Secretary General of the Civil Aeronautics Board of Chile, claims that these losses in fifth freedom rights were unrelated to Chile's new air transport policy.

This loss of fifth freedom traffic, in addition to domestic deregulation in Chile, has dealt a major blow to LAN-Chile. In Table B-2 we note that in 1978 LAN-Chile had net profits of 3 million U.S. dollars. In 1981 it suffered a \$35 million loss and in 1982 an additional 30 million U.S. dollar loss. (It's 1982 revenues were \$140 million.) However, to put LAN-Chile's profits in historical perspective we note that traditionally LAN-Chile has made major losses. In 1972, for example, LAN-Chile recorded a loss of 12 million dollars.

Ladeco had a net loss of one million dollars in 1978, a net profit of one million dollars in 1981, and a net loss in 1982 of ten million dollars (see Table B-2). The latter loss however was related to several aircraft purchases in that year. In terms of operating profits Ladeco had a two million loss in 1978, a five million dollar profit in 1981, and a six million dollar profit in 1982. LAN-Chile's operating profits in the same years were three million, negative 33 million, and negative 19 million dollars.

Table B-2

Chilean Air Carriers Profits
(In millions of U.S. Dollars)

	LAN-Chile		Ladeco	
	Net Profit	Operating Profit	Net Profit	Operating Profit
1972	-12	N/A	N/A	N/A
1978	3	3	- 3	- 2
1981	-35	-33	1	5
1982	-30	-19	-10	6

Source: ICAO. Financial Data

In terms of wages we have very little information.⁵ We do know that wages in air transport have fallen dramatically in Chile. We do not know whether this fall in wages has been greater than the general fall in wages dictated by the current regime throughout the economy of Chile.

B.4 Summary and Prospects

Clearly LAN-Chile, the government flag carrier, has been hurt by the new law as well as by the revocation of fifth freedom rights. The carrier, at the request of the government, hired an aviation consultant from the U.S. (Aviation Consulting Inc.) to assess its situation. That consultant recommended: that LAN-Chile reduce its number of employees by an additional 38 percent; that Chile adjust its law to control international operators (to prevent competition); and that Chile merge LAN-Chile and Ladeco, stating that two companies are too many for Chile. The government of course had not merged LAN-Chile and Ladeco and no new developments are in sight in the international area. Chile, being at the very end of all international routes, has very little bargaining power. For example, it has no rights it can offer to other carriers for carrying traffic through and beyond its country.

LAN-Chile was recently reorganized and a new manager was appointed. The ownership of LAN-Chile was changed from a single department of the federal government to include the department responsible for economic development. Under new management, LAN-Chile is setting up several internal independent units in an attempt to improve efficiency by having employees compete with each other.

Employee groups at LAN-Chile have been pressing the government for removal of the law. These attempts are not being supported by employees at other air carriers nor by citizens outside air transport.

Overall since deregulation we observe an increase in traffic growth in Chile at least partially in response to a real fall in airfares (growth in normal fares less than the growth in the consumer price index). While traffic has grown, employee growth has been much more modest. In fact, it has been decidedly negative at LAN-Chile. This has resulted in a dramatic increase in productivity for Chile's two airlines. In terms of labour productivity, Chile's airlines rank among the highest in the world. In a survey of 93 of the world's largest airlines LAN-Chile currently ranks 14th in terms of labour productivity and Ladeco ranks 37th (see Table B-3). These rankings however mask the true productivity of these two airlines. For example the top ranked air carrier, Flying Tigers of the U.S., is an airline flying very long stage lengths and providing only cargo services. The productivity rankings in Table B-3 do not control for the effect of the stage length of the carrier nor the composition of its output.

When asked to assess the overall impact of deregulation in Chile Langlois of the CAB stated that over all, deregulation has been successful in Chile. He stated that no important changes are foreseen in Chile's domestic regulation of air transport. He indicated that some adjustments in its international position will be attempted in order to increase Chile's participation in foreign markets. However, he also notes that Chile has a very weak bargaining position in bilateral negotiations.

Table B-3

Labour Productivity Ratios

93 Air Carriers

Carrier	Country	Lab. Prod.	Unit Cost	RTK	Trip Length	Load Fact.	Pass-engers
FLYINGTIGR	USA	568.	27.	3210.	8891.	70.	377.
TRANSAMER	USA	391.	37.	790.	7034.	62.	814.
JAPN-ASIA	JAPN	351.	84.	152.	1696.	67.	666.
WORLD	USA	337.	40.	890.	4162.	65.	2036.
CAPITOL	USA	272.	42.	426.	3590.	74.	1206.
NORTHWEST	USA	247.	57.	3223.	2230.	49.	11306.
KAL	KORE	239.	46.	2066.	2877.	69.	4210.
JAL	JAPN	235.	60.	5016.	2441.	62.	14115.
SIA	SING	226.	6.	2388.	3954.	71.	4409.
AIRBRIDGE	UK	220.	106.	10.	0.	41.	0.
AVIACO	SPAI	204.	75.	308.	1244.	61.	2937.
AVIATECA	GUAT	196.	126.	21.	1389.	45.	124.
PAN AM	USA	185.	66.	5992.	3444.	57.	13939.
LAN CHILE	CHIL	180.	90.	257.	3572.	55.	449.
QUANTAS	AUST	144.	64.	1859.	7062.	63.	1911.
AIRPANAMA	PANA	140.	72.	45.	1739.	89.	168.
TWA	USA	140.	76.	4468.	2320.	54.	18014.
WESTERN	USA	140.	77.	1469.	1398.	52.	9380.
INAIR	PANA	139.	68.	12.	0.	62.	0.
AMERICAN	USA	139.	76.	5083.	1791.	53.	24902.
BRANIFF	USA	139.	87.	1479.	1295.	47.	10505.
CP AIR	CAN	136.	55.	1243.	2874.	62.	3892.
KLM	NETH	136.	65.	2594.	3661.	64.	4455.
UTA	FRAN	135.	85.	964.	5486.	57.	937.
UNITED	USA	134.	73.	6293.	1899.	52.	29189.
TAN	HOND	134.	80.	28.	1461.	49.	94.
CONTINENTL	USA	131.	78.	1453.	1551.	49.	8426.
CALEDONIA	UK	129.	66.	823.	2574.	58.	2257.
AIRFRANCE	FRAN	124.	71.	4160.	2352.	63.	11592.
GARUDA	INDO	120.	71.	868.	1475.	45.	4292.
DAN AIR	UK	118.	89.	324.	1392.	83.	3052.
AIR CANADA	CAN	117.	65.	2698.	1858.	51.	12497.
LUFTHANSA	WGER	117.	80.	3601.	1698.	62.	12981.
SAH	COLO	117.	63.	63.	637.	55.	622.
THAI INTL	THAI	116.	53.	896.	3462.	61.	2145.
LADECO	CHIL	115.	98.	56.	1124.	65.	437.
MORDAIR	CAN	111.	74.	143.	1278.	0.	1193.
DELTA	USA	110.	88.	4035.	1160.	46.	8435.
EASTERN	USA	108.	87.	4352.	1181.	53.	36102.
FAUCETT	PERU	107.	71.	98.	845.	56.	850.
ICELANDAIR	ICE	107.	98.	124.	2550.	72.	509.
BRIT AIR	UK	106.	74.	4794.	2509.	64.	15297.
TEXASINTL	USA	105.	93.	342.	893.	49.	3918.
SOUTH AFR	SAFR	103.	79.	1171.	2339.	51.	4009.
SABENA	BELG	98.	94.	941.	2639.	66.	2055.

Source: Tretheway (1984)

Table B-3 (cont'd)

Carrier	Country	Lab. Prod.	Unit Cost	RTK	Trip Length	Load Fact.	Passengers
CYPRUS AIR	CYPR	98.	68.	95.	1882.	69.	455.
SWISSAIR	SWIZ	97.	93.	1506.	1924.	60.	6263.
PSA	USA	97.	105.	336.	606.	44.	6159.
PAL	PHIL	96.	67.	836.	1859.	55.	2920.
ALIA	JORD	96.	68.	409.	0.	59.	1467.
FRONTIER	USA	92.	97.	540.	951.	52.	6457.
AIR NZ	NZEA	90.	81.	731.	1970.	63.	3212.
SAS	SCAN	89.	100.	1429.	1239.	58.	8486.
ALITALIA	ITAL	85.	102.	1583.	1762.	59.	7006.
LAB	BOLI	83.	71.	129.	669.	65.	1240.
AIRAFRIQUE	TAOU	82.	79.	413.	0.	57.	555.
PWA	CAN	81.	85.	283.	635.	54.	4221.
USAIR	USA	81.	123.	857.	662.	53.	13706.
EPA	CAN	81.	92.	73.	0.	63.	0.
REPUBLIC	USA	81.	120.	1189.	815.	43.	17006.
VARIG	BRAZ	79.	66.	1334.	1908.	51.	4514.
LASCA	COST	78.	47.	77.	1715.	75.	338.
AEROLINEAS	ARGN	76.	155.	769.	1561.	48.	3660.
FINNAIR	FIN	74.	86.	402.	1255.	57.	3098.
AEROPERU	PERU	71.	95.	111.	1066.	45.	928.
AIR INDIA	INDI	71.	59.	1089.	4647.	63.	1573.
AIR INTER	FRAN	67.	146.	394.	546.	58.	0.
ALISARDA	ITAL	65.	128.	33.	557.	63.	646.
TACA	ELSA	65.	100.	38.	1316.	60.	242.
AVIANCA	COLO	63.	73.	556.	1004.	57.	3823.
KUWAITAIR	KUWA	62.	101.	384.	2461.	48.	1260.
AER LINGUS	IRLD	61.	91.	379.	1367.	68.	2399.
MAS	MALY	60.	68.	618.	1095.	69.	4952.
ATI	ITAL	58.	212.	112.	478.	53.	1.
BRIT MID	UK	56.	151.	59.	585.	45.	1081.
TAPAIR	PORT	51.	98.	504.	1942.	55.	2160.
AUA	AUST	50.	175.	132.	936.	43.	1358.
CRUZEIRO	BRAZ	49.	105.	208.	939.	51.	2374.
SAHSA	HOND	46.	110.	25.	750.	46.	318.
ZAMBIA AIR	ZAMB	41.	140.	71.	2207.	54.	279.
ETHIOPIAN	ETHI	39.	89.	113.	1825.	57.	319.
MERPATI	INDO	36.	108.	46.	522.	64.	856.
EGYPTAIR	EGYP	34.	95.	352.	1472.	50.	2532.
PIA	PAKI	34.	75.	812.	1930.	53.	3101.
TAC	THAI	33.	96.	30.	549.	48.	695.
BIHAN	BANG	31.	72.	134.	0.	60.	0.
AIRFERRIES	UK	31.	139.	15.	1171.	46.	62.
AIR MADGR	MADG	31.	139.	56.	851.	40.	446.
AERMEDITER	ITAL	31.	206.	9.	702.	44.	0.
INDIANAIR	INDI	27.	76.	484.	789.	64.	6012.

Table B-3 (cont'd)

Appendix B - cont.
Data Used in the Study
Carrier Ranked by Labour Productivity

Carrier	Country	Lab. Prod.	Unit Cost	RTK	Trip Length	Load Fact.	Passengers
AEROCESAR	COLO	26.	110.	4.	588.	21.	0.
COPA	PANA	22.	175.	9.	665.	69.	146.
AIRMALAWI	MALA	15.	150.	11.	828.	61.	133.
AEROFLOT	USSR	0.	49.	1221.	1594.	66.	108864.
AIR LANKA	SRIL	0.	60.	180.	3452.	61.	407.
ECUATORIAN	ECUA	0.	73.	117.	0.	59.	0.
ROYAL AIR	MORO	0.	74.	298.	2183.	61.	1140.
QUEBECAIR	CAN	0.	97.	74.	836.	60.	188.
TUNISAIR	TUNI	0.	91.	211.	1383.	63.	1596.
AVENSA	VENZ	0.	124.	68.	431.	63.	0.
SAUDIA	SAUD	0.	133.	1302.	1208.	44.	9383.
PLUMA	URAG	0.	175.	19.	918.	41.	180.
AIR ZIMBAB	ZIMB	0.	158.	39.	1218.	59.	230.
AERODOMIN	DOMI	0.	0.	0.	491.	0.	0.
AIR UK	UK	0.	0.	0.	344.	0.	1028.
ARCO	URAG	0.	0.	0.	58.	0.	0.
ARNARFLUG	ICE	0.	0.	0.	1605.	0.	34.
LIAT	ANTG	0.	0.	0.	281.	0.	395.
SAFE AIR	NZEA	0.	0.	0.	0.	0.	0.
TAT	FRAN	0.	0.	0.	0.	0.	447.

We feel it is difficult to draw conclusions for Canada from the analysis of Chile's experiment with deregulation. We do note that in a country whose air traffic is only one three hundredth of that in the United States, deregulation resulted in an increase in traffic and fare increases less than that of the rate of inflation.⁴ It is clear that in this small country service to small communities has undergone a very radical transformation. This indicates the importance for Canada to consider the impact of deregulation on service to its small and isolated communities. The Chile results also suggest that deregulation may have a major impact on its work force. Policy in Canada would be well served to consider the impacts of deregulation on various employee groups.

Notes to Appendix B

1. Fifth Freedom rights give, for example, the Chilean carrier, LAN-Chile, the right to pick up passengers in a second country, Peru, and carry them to a third country, the U.S. Without the "Fifth Freedom" right, Chile could only carry passengers boarding in Chile on a Chile-Peru-U.S. route.
2. The conglomerate (not Ladeco itself) is currently in a state of bankruptcy. It is attempting to sell one of Ladeco's jets in order to raise cash.
3. Its 1982 revenues of U.S.\$13.5 were only 6.5% of the revenues of the three carriers. In 1983 its total tonne kilometers performed dropped from 48.3 to 27.7. In the same year, LAN-Chile's TKP dropped from 209.9 to 132.5 and Ladeco's from 50.0 to 32.6. Both LAN-Chile and Fast Air have very long stages relative to Ladeco.
4. 1983 data became available after this report was written. In 1983 total domestic passengers carried dropped to 310,000. This would result in an annual growth rate of -1.3% since 1978. Real GNP had dropped over 16% in two years in Chile by 1983. In contrast, real GNP dropped only 2% in the U.S. in the recent recession.

5. The little data we have indicate wages (in thousands of U.S. dollars) as follows:

	<u>LAN-Chile</u>		<u>Ladeco</u>	
	1980	1981	1980	1981
Pilots	28	43	36	N/A
Cabin Attendants	7	13	7	N/A
Maintenance	8	14	18	N/A
Ticketing	7	12	12	N/A
Other	7	12	16	N/A

Source: ICAO, Fleet and Personnel. The trend in wages for Lan Chile from 1980 to 1981 is the same in Chilean pesos as in U.S. dollars.

APPENDIX C

Shifts in U.S. Costs after Deregulation

Caves, Christensen and Tretheway (1983), have measured the productivity shifts and their sources that occurred for U.S. air carriers after deregulation. Measured productivity jumped by 2.3% after deregulation from an annual growth rate of 2.8% per year to 5.1%. The proportion of this growth that was unexplained increased by .3% to 2.3% per year. Thus, 2.1% per year of the total 2.3% increase in productivity growth is due to movements to a different point on a simple specification of a production function, while .3% of it is due to a shift of the function.¹ This evidence suggests that while shift or innovative type productivity gains occurred in the U.S. after deregulation, they were small (.3%) relative to the efficiency movement type of gains that occurred (2.1%).

The preceding analysis was based on a rather simple specification of production and only included data to 1980. In Table C-1 we present the year-to-year cost function shifts that were observed from a richer specification of costs using data updated to include 1981.²

This table also contains a "growth rate triangle" indicating average annual rates of shift in the cost function for any pair of years. This table provides little information that supports the hypothesis of a dramatic shift in unit cost. For example, the rate of cost function shift was 1.8% per year for 1970-1975 versus only 1.5% for 1976-1981.

Table C-1 may be obscuring the true nature of deregulation. From 1977 to 1979 large cost shifts were observed (4.3%, 4.3%, 4.0%). However, at

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Table C-1

U.S. Cost Function Shifts
1970 - 1981

Average shift (in percent) per year

Absolute Shift in Cost Function Relative to 1977		Average Shift per Year from Year in Column to Year on Row											
		70	71	72	73	74	75	76	77	78	79	80	81
1970	16.9%												
1971	15.9	1.0											
1972	10.5	3.2	5.4										
1973	11.1	1.9	2.4	- .6									
1974	8.6	2.1	2.4	1.0	2.5								
1975	7.7	1.8	2.1	.9	1.7	.9							
1976	4.3	2.1	2.3	1.6	2.3	2.2	3.4						
1977	0.0	2.4	2.7	2.1	2.8	2.9	3.9	4.3					
1978	- 4.3	2.7	2.9	2.5	3.1	3.2	4.0	4.3	4.3				
1979	- 8.3	2.8	3.0	2.7	3.2	3.4	4.0	4.2	4.2	4.0			
1980	- 2.2	1.9	2.0	1.6	1.9	1.8	2.0	1.6	.7	- .9	-6.1		
1981	- 3.3	1.8	1.9	1.5	1.8	1.7	1.8	1.5	.8	- .3	2.5	1.1	

Source: Derived from Caves, Christensen, Tretheway (1985)

the end of that year, the U.S. began sliding into what became its largest post-war recession. In addition, in 1979/80 airline fuel prices increased 250%, and the air traffic control system was disrupted in 1981 (and thereafter) due to a strike by the air traffic controllers.

Table C-2 and Figures C-1 and C-2 compare growth rates of unexplained airline productivity (i.e. production function shifts) and U.S. real GNP. Figure C-1 in particular, demonstrates the correlation of unexplained TFP with the business cycle. What is interesting in Figure C-2 is that in 1981, as the U.S. was (temporarily) pulling out of the first phase of the 1980-82 recession, unexplained airline TFP during a recovery was, for the first time in the 1955-81 period, as strong as real GNP growth.

Nevertheless, from these results we feel that present evidence is weak of a shift in the production function since deregulation. Accordingly, we do not predict any such shift in our simulations of cost in the Canadian airline industry under deregulation type policies.

Some observers feel that as more information becomes available we will eventually observe a strong increase in unexplained airline TFP following deregulation. They cite the fact that in 1981, new entrant air carriers were only starting to appear and had not yet put any pressure on incumbent carriers. Several work rule concessions were made by unions after 1981, and those made before 1981 had not yet made themselves felt in our data.

The cost function shifts observed in Table C-1 come from a cost model which economists describe as being "Hicks neutral". This means that the cost shifts are simply measured and no attempt is made to determine whether labour in particular is the source of some of the shift. In Table C-3 we investigate models which allow us to investigate some of the sources of the

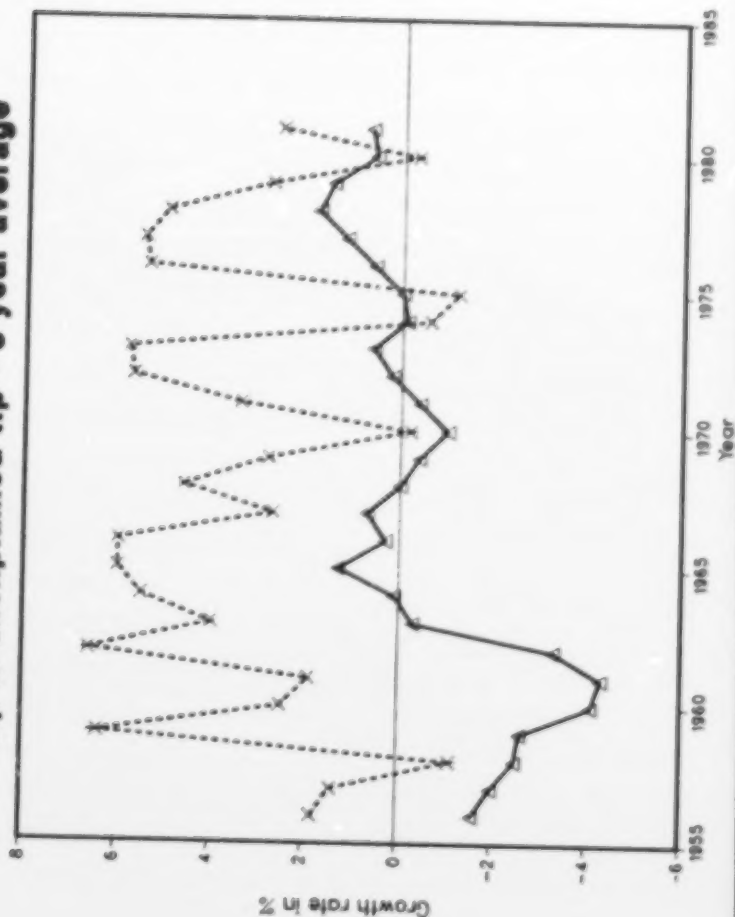
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Table C-2

Unexplained Airline TFP and U.S. Real GNP
Year-to-Year Growth Rates
1955 -1981

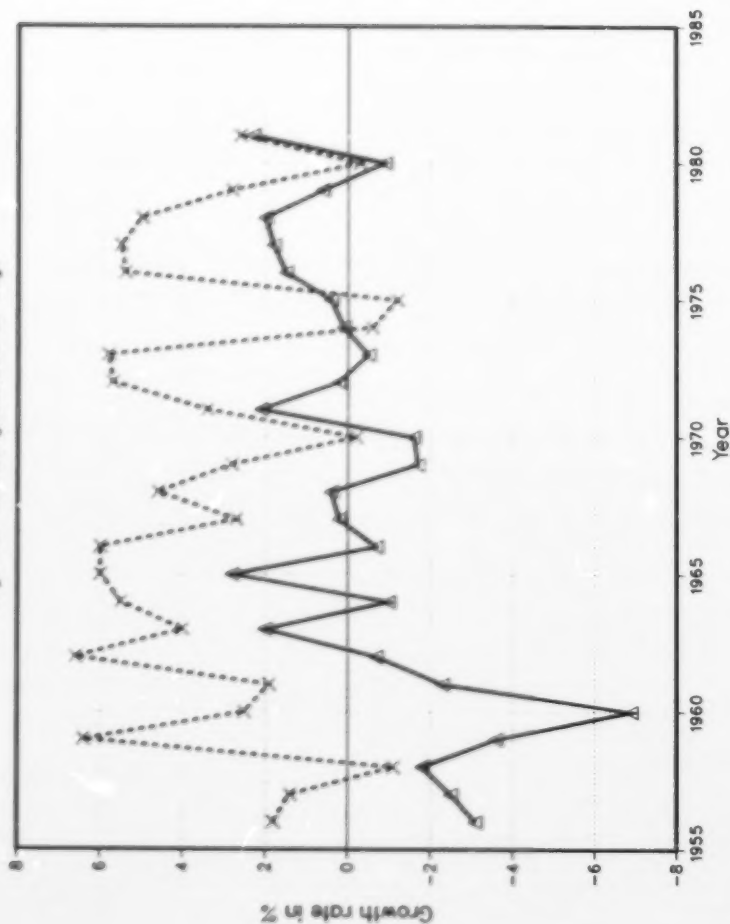
	U.S. Real GNP	Unexplained Airline TFP	3 Year Moving Average of Column 2
1955/56	1.8%	- 3.1	- 1.6
1956/57	1.4	- 2.5	- 2.0
1957/58	-1.1	- 1.8	- 2.5
1958/59	6.4	- 3.6	- 2.6
1959/60	2.5	- 6.9	- 4.1
1960/61	1.9	- 2.3	- 4.3
1961/62	6.6	- .7	- 3.3
1962/63	4.0	2.0	- .3
1963/64	5.5	- 1.0	.1
1964/65	6.0	2.8	1.3
1965/66	6.0	- .7	.3
1966/67	2.7	.2	.7
1967/68	4.6	.4	.0
1968/69	2.8	- 1.7	- .4
1969/70	- .2	- 1.6	- 1.0
1970/71	3.4	2.1	- .4
1971/72	5.7	.2	.2
1972/73	5.8	- .5	.6
1973/74	- .6	.1	- .1
1974/75	-1.2	.4	.0
1975/76	5.4	1.5	.6
1976/77	5.5	1.8	1.2
1977/78	5.0	2.0	1.8
1978/79	2.8	.6	1.5
1979/80	- .3	- .9	.6
1980/81	2.6	2.3	.7
1981/82	-1.9	N/A	N/A

Sources: Federal Reserve Bank of St. Louis, Annual Economic Statistics, and currently unpublished work by Tretheway on U.S. Airline TFP, 1947-1981. Moving average is a trailing moving average.

U.S. TFP and Real GNP Annual Growth Rates in % **tfp is unexplained tfp - 3 year average**



U.S. TFP and Real GNP Annual Growth Rates in % tfp is unexplained tfp



U.S. Airline Cost Function
Shifts in Cost Function 1970-81
Shifts Relative to 1977 in Percent

(Standard errors in parenthesis)

	Hicks Neutral Model	Models with Input Specific Shifts in Cost			
		Input Shift Every Year		3 Discrete Input Shifts	
	General Shift in Cost (1)	General Shift in Cost (2)	Labour Specific Shift (3)	General Shift in Cost (4)	Labour Specific Shift (5)
1970	16.9 (1.8)	16.6 (1.8)	4.2 (1.2)	16.6 (1.8)	1.6 (1.0)
1971	15.9 (1.7)	15.6 (1.7)	2.9 (1.2)	15.5 (1.7)	
1972	10.5 (1.4)	10.1 (1.5)	1.2 (1.2)	10.1 (1.5)	
1973	11.1 (1.4)	10.6 (1.4)	1.2 (1.2)	10.6 (1.4)	
1974	8.6 (1.3)	8.9 (1.3)	1.4 (0.9)	8.8 (1.3)	-0.4 (0.7)
1975	7.7 (1.3)	8.2 (1.3)	1.7 (0.9)	8.1 (1.3)	
1976	4.3 (1.2)	4.9 (1.2)	0.8 (0.8)	4.8 (1.2)	
1977	-	-	-	-	-
1978	-4.3 (1.5)	-3.8 (1.5)	-3.4 (0.8)	-3.7 (1.5)	
1979	-8.3 (1.9)	-9.2 (1.9)	-4.6 (0.9)	-9.3 (1.9)	-2.9 (0.9)
1980	-2.2 (1.7)	-4.8 (1.8)	-1.5 (1.1)	-3.4 (1.7)	
1981	-3.3 (1.8)	-4.7 (1.9)	-2.2 (1.1)	-4.6 (1.8)	

shifts. Column 1 repeats the Hicks neutral shifts in Table C-1. Columns 2 and 3 enrich the specification by allowing shifts in each year specific to labour.³

Negative values for the shifts indicate that less labour is needed to produce the same level of airline services than in 1977, even if labour price is unchanged. Negative values correspond to what economists call a labour saving change in technology. Examining column 2 we see this model has general shifts in cost very similar to those in column (1). Column (3) indicates that these shifts have indeed been labour saving since 1977. With the exception of 1980 (when fuel prices had increased 250%) all of the post 1977 shifts are statistically significant. The 1981 value of 2.2 indicates that the share of labour expenses in total cost was 2.2% lower in 1981 than it was in 1977.⁴

In columns (4) and (5) we repeat the analysis but this time only allowing for three shifts in the labour specific component of cost. This allows us to statistically examine broad trends in the shift. We see that the two pre 1977 shifts (one before and one after the first oil crisis), are not statistically significant, while the post deregulation shift is significant. From these results we conclude that technical change has indeed been labour saving in the U.S. since deregulation.

While these results support the labour saving hypothesis of deregulation (which would lower total carrier costs), we choose to err on the conservative side and not add a labour saving shift to our deregulation cost simulations for Canada.

Notes to Appendix C

1. The numbers do not sum due to rounding of figures to one decimal.
2. See Caves, Christensen, Tretheway (1985). This specification used the richer translog model of cost and included network variables in the model.
3. In keeping with the homogeneity restrictions on input prices, shifts are provided for all other inputs, and these shifts are homogeneous of degree zero.
4. The absolute share is 2.2% lower. For example, if labour share was 35% for a carrier in 1977, with 1981 technology it would be 32.8%. This controls for input prices. Thus, with 1981 fuel prices we might have expected the share to be, say, 31%, but instead it would be 28.8%.

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